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THE IRON INDUSTRY IN ITS RELATION TO RAILWAYS.

BY S. H. FINCH.

[Written for the AMERICAN RAILROAD JOURNAL.]

IRON is by far the most important of the metals, and there are few substances to which it yields in interest when it is considered how very intimately the knowledge of the properties and uses of iron is connected with human civilization.

Metallic iron is of exceedingly rare occurrence; it has been found at Canaan, in Connecticut, forming a vein about two inches thick in mica-slate, but it invariably enters into the composition of those extraordinary stones known to fall from the air, called meteorites. Isolated masses of soft, malleable iron also of large dimensions lie loose upon the surface of the earth in South America and elsewhere, and are presumed to have the same origin; these latter contain in common with the iron of meteorites, more or less nickel. The iron industry covers a very large field, and space afforded does not admit of even an effort at a comprehensive consideration of it, involving, as it does, so many varied interests, for while an accurate record of railway building since its inception would be a satisfactory index of the iron industry, it would not tell half the story.

In a former number of the JOURNAL, in connection with this subject, I gave a statement of the total pig-iron production of the world, which was prepared with a view to make it as accurate as possible. It may be well, perhaps, to supplement this with some further statistics concerning the use of iron and steel as affected by the construction of railways during the past ten years for rails alone.

In 1873 there were only 890,077 tons of rails manufactured in the United States; in 1874, 729,414 tons.

In 1875, 290,863 tons of steel, and 501,649 tons of iron.
In 1876, 412,461 tons of steel, and 467,168 tons of iron.
In 1877, 432,169 tons of steel, and 332,540 tons of iron.
In 1878, 550,398 tons of steel, and 322,890 tons of iron.
In 1879, 683,964 tons of steel, and 420,160 tons of iron.
In 1880, 954,460 tons of steel, and 493,760 tons of iron.
In 1881, 1,330,302 tons of steel, and 488,581 tons of iron.
In 1882, 1,438,155 tons of steel, and 227,874 tons of iron.
In 1883, 1,500,200 tons of steel, and 200,000 tons of iron.

At the close of 1875 there were 713 blast furnaces in the United States, and 10 in course of construction; of this number, 420 were out of blast.

Dec. 31, 1877, there were 270 furnaces in blast and 446 furnaces out of blast.

Dec. 31, 1883, there were 307 furnaces in blast and 376 furnaces out of blast.

The price of rails which, in 1867 was $160 per ton, fell to $75 in 1875; to $45 in 1878; and a contract has recently been closed for 10,000 tons at $25.50 at the mill, which is an extremely low price, and a serious question arises as to the possibility of manufacture for the price stated.

In 1874 there were 91 rail mills, although 22 were idle, and the capacity of the entire number was double the actual production. How far this question of price and production has been influenced by the failure of the owners of the Bessemer plant to introduce the "Gilchrist-Thomas" or "basic" process—which they also own—is of course a matter of conjecture. It is probable, however, that the consumers of iron and steel would be benefited largely if this process is available in the reduction of ores that are not adapted to the Bessemer system of steel-making; these ores being known as low grade ores, but having the equivalent advantage of so much less haulage as to make it appear probable that the cost of finished product would be lower than Lake Superior ores when worked by the Bessemer system.

But iron and steel-making is not confined to the production of rails, and new uses must be found in order to utilize the enormous capital invested in steel-works, and absorb an equally great amount of labor.

One of the most prominent tendencies of the present time, as well as one of the most interesting applications of engineering skill, is the substitution of iron and steel for timber, wherever the change can be made with advantage, and more especially in connection with railway appliances. The object of the change may be either to reduce the cost of construction or to increase the strength and durability, thus prolonging the life of any structure and resulting in economy of maintenance. The timber production of America has been estimated at ten thousand millions of superficial feet, or more than eight hundred millions of cubic feet, an amount far beyond the grasp of comprehension. About one-sixth of this vast amount goes to the maintenance of railways and five million cubic feet is used for telegraph-poles.

That metal, as iron or steel, has not yet been tried to any extent in this country as a substitute for wood in railway-ties is well known, but existing circumstances would seem to warrant a consideration of undertaking such a change in railway repairs. The 120,000 miles of railway in the United States, require no less than 260,000,000 ties—and if the average life of each may be put at seven years it will be seen that 37,000,000 of ties become useless each year—there would annually be expended in the United States for railway-ties not less than $15,000,000; and should there continue an increase in miles of road and performance on existing roads, the price of wood ties will rapidly increase unless methods of preserving the timber should be very generally adopted or the substitution of a more durable material than wood, viz., iron or steel.

Iron railway-ties have been to quite an extent intro-

duced in Europe and on some East Indian roads, where it appears that the cost of maintenance as compared with junglewood, was found in five years to be as three to one in favor of metal ties.

It is not proposed here to recommend any special design of tie to be made of iron or steel as a substitute for the ordinary wood tie, but rather to mention such features as may be considered desirable in selecting a design, and to indicate the possibility of making such substitution, and the advantages that are believed would follow, which would be chiefly in the improved condition of roadway and a large reduction in cost of repairs.

The stable nature of iron or steel as compared with wood, when used under conditions of exposure in this climate, would seem to secure an improved surface, uniformity and smoothness of track not attainable with the wood-tie. Now the requirements of an iron or steel tie would be that:

First—They should be of such form, and so arranged as to distribute the weight of passing trains over the whole width of embankment.

Second—They should be so constructed that but little or no skilled labor would be required to lay properly and fasten the rails accurately to gage, without any possibility of variation.

Third—There should be the same area of bearing surface as with the wood-tie.

Fourth—They should be as convenient for leveling the road or taking out a rail when necessary.

Fifth—They should be convenient to handle in loading and transportation.

Sixth—They should consist of as few parts as possible, not involving the necessity for peculiarly-constructed bolts, nuts, or washers, or differential holes for accommodating any change in gage on curves.

Seventh—They should combine elasticity with all the strength of the wood-tie necessary to prevent spreading of the rails.

Cottages for laborers and miners could doubtless be constructed of iron at about the same cost as wood, and the stations of the elevated railways in this city afford examples of what may be done in that direction. Iron tents or barracks for troops in regular service also, would open up another field for iron trade. In the construction of coal and freight-cars, it is believed that iron must soon take a prominent part, although experience so far has not been as satisfactory as anticipated.

And although the change from iron to steel so largely accomplished in relation to rails and steam-boilers has diminished the relative production of iron, yet successful attempts have been made to produce a higher quality for special purposes, and the total production of both iron and steel may be expected to continue in growth with the conviction that the minimum price is now about reached. As iron grows cheaper the area of its use will extend, and we shall thus have a larger production of finished iron, though the value per ton is proportionately lower.

In all branches of the coal and iron trades wages have retreated in sympathy with the price, and now are perhaps as low or lower than for years, and probably raw materials are also at their lowest. The dullness in the demand has marked itself thus, and its effects are seen in all branches of the trade as well as felt by all classes connected with it. Wages and rates are at their lowest, full time is far from being known at the mines or mills, and there has been, during the last year, a very large decrease in operating expenses of nearly all kinds, and a consequent advancement towards a sound footing on the threshold of another season of prosperity.

There seems to be little prospect of an immediate revival of railway building in this country, and it may not be judicious to wait for large enterprises to be initiated in that direction; but rather to open up a more extended market beyond the border of the United States, as Mexico and South America, and distant China is almost ready for the introduction of railways and the allied industries. It is true that Mexico has valuable iron deposits as well as of the precious metals, but it is also true that some time is likely to elapse before the manufacture of iron can be carried on in that Republic in so economical a manner as to compete seriously with our own skilled steel-makers.

THE REQUIREMENTS OF A PERFECT COUPLER.

BY RICHARD RANDOLPH.

[Written for the AMERICAN RAILROAD JOURNAL.]

AS THERE have been issued between three and four thousand patents upon devices for car-couplings, and as none of them have been found to answer the requirements of railway practice, the construction of a perfect coupler is justly considered a difficult mechanical problem, and a standing challenge to the ingenuity of inventors. An examination of these attempts proves that the great majority of the inventors have not informed themselves of the conditions of the problem in practice and have wasted their ingenuity upon false assumptions.

The most common of these assumptions is that the two cars to be coupled will coincide vertically; and the fact is overlooked that, however identical may be the pattern of the cars, the elevation of the couplers will depend upon the extent to which they are loaded; as all of them must rest upon springs, and all springs are compressed nearly in proportion to the compressing force, and also that springs become permanently compressed after a length of service and from the great inequality incident to the variations in the character of the steel and the process of tempering. Another cause of the vertical displacement of the coupler is the straining of the timbers and bolts which hold them in position, by the irregularities of the track over which they pass at full speed.

The next erroneous assumption is that the couplers will coincide horizontally. But as the traffic of railways requires a variety of cars, and as the different car-builders have different ideas of the proper proportions of cars of the same character, the central point at the ends will vary from the center of the track upon curves according to the distance between the trucks and the distance from the trucks to the ends. And there are many points in the yards and about switches and sidings where the irregularities of the track, independent of curvature, will prevent the couplers from coinciding horizontally. And, as in the case of vertical deviations, the straining of the timbers and bolts during the service will give a permanent set to the couplers to one side.

These facts show the necessity for the couplers being

independent of a considerable deviation, both vertically and horizontally, in the act of automatic coupling; and of equal importance is it that the connection should freely allow of the constant movement of the connected ends of two cars in all, and in contrary directions, incident to tracks in the best condition, where the speed of the train develops these sudden and forcible actions from the slightest irregularities; otherwise the parts of the coupling apparatus will be either strained, bent or broken.

To meet these unavoidable conditions, a link common to the two draw-heads and capable of deflecting in all directions is absolutely indispensable, a fact which long experience in railroading has fully demonstrated. After the multitudinous contrivances and experiments that have been made in the attempt to improve upon the process of coupling, the link and pin have constantly held their impregnable position; and it may be safely asserted that when we consider only the operation of the link and pin coupler most commonly employed to-day, after the connection is once made, it cannot be materially improved upon. The question then occurs, in what does the common coupler need alteration and addition, and in what requisite is it wanting?

The first and by far the most important requisite is safety to the employé who operates in the process of coupling. The coupler should do of itself that which he now constantly exposes life and limb to do. It should hold the link of one draw-head in the proper position and with the necessary firmness to enter the unoccupied mouth of the other according to the deviation of the two in any direction. It should hold the pin of the latter within its hole high enough to be entirely clear of the mouth and drop it at the instant the link has fully penetrated it, while the operator stands to one side watching the process entirely clear of the cars.

So much for the question of safety. But there is another consideration which may be of more influence with a large class of persons; that of economy. When we consider the great number of links and pins that are lost and stolen, and the delay and vexation caused by the necessity of supplying those that are missing in the yards and along the line of the road, it becomes a desideratum that both link and pin shall be permanently attached to the draw-head, but in such a manner that they shall not interfere with each other, and allow both to act in connection with the ordinary coupler. As a great many links are bent and broken, from the fact that they are left protruding from the draw-head to receive the impact of contiguous cars, it is essential that the draw-head should be prismatic in form and hollow, so as to be capable of receiving the unemployed link entirely within it, out of the reach of this injury and out of the way of the employed link; a form which happens to be the one that is most conducive to strength as it transfers the force of impact in the most direct lines to the points of resistance at the dead-block behind it.

Such an improved coupler should be simple and strong in construction, free from derangement, and require the least amount of material and workmanship. It should require no alteration in the structure of cars now in use, and be perfectly adapted to couple with the draw-heads in common use, and with the ordinary link and pin, should the link or pin, or both, of the improved one be removed. It should also be itself the medium of transferring the force of a sudden push or pull to the spring-buffer and dead-block in such a manner that the same spring shall operate in both directions, and that the same connection of the draw-bar to the draft timbers shall serve for both dead-block and draft and spring-buffer; otherwise separate apparatus will have to be provided, increasing the cost and diminishing the efficiency.

We frequently have heard the fact boasted of by the inventors of couplers, that a long train of cars have been all coupled by a single backing of the engine; as if this feat were any indication of the value of the coupler. This can be done with most of those which are utterly worthless in ordinary railway practice. And the very fact that couplers are liable to connect with contiguous cars without a previous adjustment is of the greatest disadvantage; for thus cars will be frequently connected accidentally and carried off either prematurely or in the wrong direction, necessitating the delay and labor of disengaging them. Besides, such a thing as the simultaneous coupling of a number of cars is never required in practice. It is either with a single car or with a number already connected that it is requisite, in almost every instance, to couple at one time. And however perfect may be the automatic action of the coupler, the importance of certainty in such a matter will demand that every act of coupling shall be witnessed by an operator if not induced by him, in which case there is no appreciable additional expense of time and trouble for the witness to make the adjustment.

There is no necessity for any apparatus for uncoupling to be operated from the top or sides of the car. The cases in which it is necessary to uncouple while the cars are in motion are too rare to justify any additional contrivance for the purpose; and there is not the slightest danger in going in between the cars while they are standing still. It is impossible for a train to start so suddenly that the most stupid may not disengage himself; and no car will ever be constructed that does not secure standing room between two end sills, either by means of the draw-head alone or by dead-blocks on the middle of the sill, such as would require a collision at full speed to crush. With the draw-head in the form of a prism having everywhere the full diameter of the space between the draft timbers, and this abutting against such a solid resistance as the casting of Butler's buffer, and projecting the proper distance from the end sill, the two cars are as securely separated the assigned distance for safety as can possibly be accomplished by any dead-blocks upon the sills.

In order to adjust the link to the proper position for entering the opposite draw-head it does not require that the cars shall be nearly in contact; they may be a considerable distance apart, yet the eye of the operator can with accuracy set the link in the proper position to allow for the deviation of the two draw-heads. He may then retire if the coupler will do the rest.

As in the general system of the railways of the country, trains are composed of cars from every quarter and constructed according to the different plans of as many builders; and as this want of uniformity is the principal cause of the frequent maiming of the unfortunate trainmen, it is important that the car-builders of the country should agree upon some standard for the construction of the ends of the cars, and upon one that shall involve the least danger to those who handle them.

PRIMITIVE RAILWAY SERVICE.

BY WILLIAM S. VEST.

[Written for the AMERICAN RAILROAD JOURNAL.]

WHEN the first railways in this country were completed the question arose, "Who and where are the men competent to take charge of them?" It was a difficult problem to solve, for no one had, of course, any experience in the new and novel mode of traveling, fast coming into general use. Under the circumstances, it was perhaps natural that the engineers who built the roads should be selected as their superintendents. This was done in many instances, and not always to the benefit of the stockholders. In some cases it was soon made manifest that a good civil engineer and surveyor might be utterly wanting in executive ability and business capacity: essential qualifications required for the successful management of a railway.

Some roads virtually made their presidents superintendents of transportation, giving them autocratic power over all the various departments, machinery included, and most of the roads suffered greatly in consequence from misplaced energy and ignorance. It is probable that this evil existed in a greater degree in the Southern States than at the North. The writer can well remember many instances of their folly and—what in these enlightened days would be called—stupidity. One president of a first-class Southern railway, hearing of the advantages derived from eight-wheeled freight-cars, ordered one of extra length to be built with twelve, the extra wheels to be placed in the center. As the car was made of wood, and not of india rubber or whalebone, it of course ran off the track at the first curve it encountered.

Another president, a man of wealth, and prepossessed with the idea that he had an "inventive" mind, ordered a smoke-stack to be constructed, which he confidently asserted would entirely do away with the annoyance caused by live cinders and sparks, of which all passengers complained. When it is known that this wonderful "spark-arrester" was simply an ordinary smoke-stack bent in a half-circle six feet above the boiler, and coming vertically down in front of the fire-box to within a foot of the track, it is unnecessary to say that it was a ridiculous failure. A railway president anxious to show his authority, and also his knowledge of machinery in the presence of the writer, abused an engineer for allowing his piston-rods to get hot. Considering that the locomotive had just stopped after running nearly a hundred miles at a high rate of speed, it would have been a miracle if they had been cold.

But if the railways found it a difficult task to secure competent men to superintend them properly, it was still harder to obtain trustworthy engineers and firemen. Their only chance was to take machinists from the shops to act in the former capacity. Many of them became, in a few months, expert in performing all the duties required of them. Most of the locomotives in the Southern States were built in England—of a make and pattern utterly unsuited for the crude, imperfectly constructed railways then in existence in that part of the country. They were more complicated than those of the present day, and much more liable to get out of order. It was not until about the year 1838 that the engines made by Norris, Baldwin and other eminent American builders, put a stop to the English importations; their greater adaptability to our railways with their short curves and heavy grades, only then being fully acknowledged.

As the railways rapidly increased, so did the demand for skilled engineers, in a still greater ratio. To meet this difficulty, some roads promoted their firemen, who, after a few weeks of experience as such, were made to act as engineers, commencing with freight-trains only. They received fully $20 per month less than those who considered themselves "regulars" in the service, and who called the new recruits "corn-field" engineers. Nor was this appellation inappropriate—most of them being totally uneducated, and much more capable of plowing well than of running a locomotive. Flues were burnt out and brasses and journals ruined weekly—evils resulting from carelessness and a lack of intelligence. The writer has known of a passenger-train being delayed for hours simply because the newly-promoted fireman did not know how to run his engine with one cylinder, and of another train standing still all night in a swamp in the sickly month of September, the long delay being caused by the slipping of the eccentrics on the axle from the loosening of the set-screws. A hammer and a monkey wrench would have set the train in motion in a few minutes, provided the engineer had known how and where to use them. These were small matters when compared to the damage done to brasses and journals simply from being keyed too tightly. The amount of oil consumed by these greenhorns was appalling. If the learned contributor who writes so ably for the JOURNAL on "Lubricants" had witnessed the waste which for years took place without any successful attempt being made to stop it, he would no doubt have been overwhelmed with astonishment.

In the Southern States, most of the firemen were negroes—some free and some slaves, the owners of the latter receiving comparatively high wages on account of the extra risks to which their property was subjected. As negroes were never in the line of promotion, many of them were, simply as firemen, superior to some of the Caucasian race, and could be found acting in that capacity for years on the same railway. As a rule, they gave more satisfaction than the uneducated white man, and became experts from long experience. They were more obedient than the white fireman, and took a greater pride in keeping their engines clean. It is somewhat strange in these radical days, when negroes have figured in our national councils as Senators and Representatives, that not one—so far as the writer's knowledge extends—has been employed as engineer on any railway in the United States, North or South. The prejudices of the traveling public may account for this fact. Colored men are engineers on steamboats, at rice and saw mills, scattered over the entire South, but none are to be found on a railway, and from the railway standpoint none should be found. If a negro, running a passenger-train on any railway, North as well as South, should meet with an accident involving loss of life, even if the disaster was plainly unavoidable and no fault of the sable engineer, what a shout of indignation would roll over the land! The officers of that unhappy railway would have a hard task to convince the public that the misfortune was not caused by either the incompetency or carelessness of the

unfortunate darkey. Knowing this, all Southern railways employ white men only to take charge of their locomotives, and they will probably do so for many years to come.

Crude as may have been the railways of those days, the train equipment was cruder still, and the same ignorance and incapacity was visible in every department of the service. Skilled labor was not only at a premium, but absolutely unattainable, and it has only been by the work of years that the present high state of intelligence and capability on the part of engineers and train-hands generally has been evolved. Great as has been the growth of the railway industry within the writer's recollection, the wonderful increase of effective train-service is equally surprising, and in view of the ignorance prevailing in the primitive days of railroading in this country, the chief cause for marvel is that accidents were as few as they were. Deprive our present leading railway lines of their skilled labor of to-day, and give them the ignorant train-hands of fifty years ago, and their "progressiveness" would not strike us with pronounced vigor. The fathers of American railways had much to contend with, and in view of the drawbacks under which they labored, the success which they attained, limited as it was, is most remarkable, and the candid observer is forced to conclude that the increased speed and comfort of modern railway travel is as much due to the superior intelligence of the employés as to the energy and talent of railway management, though the former is a not unnatural outgrowth of the latter. The recognition of the value of intelligent service is one of the cardinal points of executive ability, and in fostering a growth of intelligent train-service, the railway manager shows his energy in the most convincing light.

THE VARNISHING OF PASSENGER-CARS.

BY D. D. ROBERTSON.

[A Paper read before the Master Car-Painters' Convention, Boston, Mass.]

THE subject which the association has assigned to me for this convention has always been regarded as important. There is no branch of the business which gives the painter more anxiety than the varnishing department. It is more susceptible to an endless variety of difficulties and therefore needs more close and careful attention than all other branches put together, and even with all the research and practical experience which has been given to the subject, we are yet far from coming to a definite conclusion as to the causes of many of the unfavorable results.

Beauty and durability is what we aim at in the paint-shop, and from my experience in varnish work, we may have beauty without durability; but we have rarely durability without beauty, so that the fewer defects of any kind in our work, caused by inferior material, inferior workmanship or any other cause, it is more likely to be durable, and ought therefore to possess beauty. There are certain qualities absolutely necessary to durability in varnish. The materials of which it is made must be of the proper kind, pure and unadulterated, the manipulation in manufacturing must be correct as to time, quantities, temperature, handling, etc., and age is also necessary. The want of durability arising from the quality of the materials, or from the manner of manufacturing, the painter has no control over; but let me say here that frequently a first-class varnish has been used upon a car, and after being in service for a short time it deadens, checks, cracks, chips, or flakes, and therefore shows a very poor record. The varnish is condemned, when in reality had the varnish been applied under different circumstances and over different work, the result would have been good and the durability satisfactory. I am satisfied that in many cases first-class varnish has to bear the odium, when the root of the evil is to be found nearer the foundation. The leading varnish manufacturers of this country have expended large fortunes to secure the best skill and appliances, and indeed to do everything to bring their goods to perfection. Their standing and respectability puts them beyond suspicion, and their reputation is of too much value for them knowingly to put into the hands of large consumers an inferior article, and even when we have just cause to complain of the varnish we ought to be charitable enough to attribute the mistake to circumstances beyond their control (for every kettle-full is subjected to such circumstances), and not to charge them with using cheap or inferior material for the sake of gain.

If the question which has been given me means to give some method of testing before using, I confess my inability to answer. For varnish, to be pronounced "durable," must be composed of the materials to make it so, and to ascertain this, chemistry must be called in to test it. Comparatively few painters understand chemistry sufficiently to analyze, and if they did and found the material all that is necessary, the manipulation may have been defective, so as to injure its wearing qualities, and therefore I cannot suggest any way of pronouncing varnish durable before using it.

As to the common custom of hanging out boards prepared and varnished, to the exposure of the sun and weather for months, it does not seem to me to be the correct way of testing durability. It is true we may by this mode get some idea of wearing properties, but the most thorough and correct way is to put the varnish to the same exposure, the tear and wear that it would have in the regular service on the road on which it is to run. Cars while running are exposed to circumstances which boards on the wall are not subjected to. The cars under my charge run through two different countries and three different States, and are therefore subjected to such a variety of climate and soil that the testing by stationary boards would completely fail to give the correct result. For example: I have placed two sample boards, prepared and varnished, and exposed them to all kinds of weather and to the constant and steady rays of the sun for an equal length of time, and both gave favorable results; and I have also put the same varnishes on a car and found very different results. One of the varnishes having some properties better adapted to resist the friction caused by cinders, sand and dust, is consequently not so liable to cut the surface, and therefore much more durable.

The system which I adopted long ago, and to which I still adhere (not on account of "old fogyism," but for want of better), is as follows: I have two varnishes which I want to put into competition to test their relative merits. With Varnish No. 1 I do the south half of the east end of the car and the east half of the south side of the car, the north half of the west end, and also the west end of the

north side; this is also done with the same varnish. On the other half of the car varnish No. 2 is put.

Thus you will see it is so placed that should the car be turned at any time, both varnishes on each side will have the same exposure and circumstances to contend with. This I regard as the best method to test the durability of varnish. And again let me say that it would be wrong for me to argue that because the varnish which I use gives me the best results, therefore I would regard it the best for all to use. This would be wrong, inasmuch as we have a diversity of climate between Maine and California, and between the extreme Northern and Southern States. The varnish which has failed to give me satisfaction may be most suitable for other parts of the country.

As to the second part of my subject, "What length of time may a car safely remain in service before being taken in for re-varnishing?" This must be regulated by the nature of the run and the general treatment of the car while in service. Through cars are frequently continuously on the road and little or no opportunity can be had to attend to them while in service. Such cars should be called in earlier than those which make shorter runs, and where ample time is allowed at both ends of the journey to be kept in order. And again, cars which are run nearest the engine cannot make so large a running record as those less exposed. Some roads—for a variety of reasons which might be given—can run cars for fourteen months with less wear than others can run twelve months. So that I hold that the master painter on every road should keep a complete and correct record of his cars, and have an opportunity to examine these at intervals and report their condition, in order to have them called in before they are too far gone for re-varnishing. If this system was more frequently adopted, the rolling stock of our roads would be more attractive and the companies would be the gainers.

I cannot lay down a standard rule as to the exact time a car should remain in service before being called in for re-varnishing, but I find as a general rule with the cars on the Michigan Central road, that they should not exceed twelve months' service, and new cars, or those painted from the foundation, should not be allowed to run over ten months the first year. By thus allowing a shorter period the first year, the car will look better and wear longer by this mode of treatment. Cars treated in this way can be kept running for six and seven years without re-painting.

AMERICAN LOCOMOTIVES IN 1884.

THE year 1884 witnessed marked depression in all departments of business, but it is doubtful if any class of manufacturers have experienced want of orders so keenly as those depending on railroad companies for patronage. If railroad managers were permitted to carry on their business in the manner well-managed private firms are conducted, they would take advantage of seasons of depressed trade to prepare their structures and machinery for the heavy traffic of coming busy times, by judicious expenditures, that could then be economically made, when labor and material were cheap. This they are not allowed to do. The tyranny of the stock market compels the majority of railroad managers to stop all expenditures that can possibly be avoided as soon as depression of business intervenes, this unwise course being pursued in order that a slightly better report of net earnings may be obtained. In many cases this policy enormously increases the ultimate expense of operating and repairs.

During last year, the curtail-at-any-expense policy has been dominant, and locomotive-builders have suffered severely from its effects. During the year 1883 seven of the largest locomotive builders turned out 1,346 locomotives, and last year the work done by the same builders was represented by 901 engines, which indicates a falling off of over 33 per cent. There are 16 locomotive-building shops in America, and three of them have ample capacity to construct all the locomotives that were bought by railroad companies last year. The parties who contemplate putting money into new locomotive-works, might find this fact worthy of consideration. Several of the builders have declined to say anything about what they are doing, but ten have given their output, which aggregates 1,001 locomotives great and small. From the data received from railroad shops, there is reason to believe that building new locomotives for themselves has been practiced rather more largely by railroad companies in 1884 than it was in the preceding year. Figures at hand indicate that about 250 locomotives were built in locomotive-shops, and if 20 are allowed for each maker whose output was not obtained—which is a liberal average—the whole production of locomotives in the United States during 1884 is 1,271. About 100 engines in this quantity were for exportation.

The tendency of railroad companies, as indicated by the engines built last year, is to employ heavy locomotives with more than four wheels connected. One builder who put up 73 engines had 16 standard eight-wheel passenger engines, 11 Moguls, 19 ten-wheel engines, 7 consolidation engines, 5 switching engines, 2 mine engines, 1 passenger four-wheel narrow-gage engine, and 12 Mogul narrow-gage engines. This can be accepted as a fair estimate of the locomotives being turned out in other shops. While engines larger than those of the familiar eight-wheel type are in growing demand, there is a decided drop in the percentage of consolidation engines built last year compared to the year before. There is a growing impression among many railroad men, that a ten-wheel, or Mogul engine, can haul all the cars on a tolerably level road that may be safely put in one train, and that heavy consolidation engines are only adapted for working heavy grades. This opinion appears to materialize in the decreased demand for consolidation engines.

A striking feature about the locomotives built last year was the small number of narrow-gage locomotives represented. Narrow-gage railroad companies are feeling the pressure of hard times peculiarly onerous, or they have not faith enough in the stability of the system to increase the rolling-stock that will be useless when standard gage is adopted.

In all quarters master mechanics manifest a desire to increase the economical efficiency of locomotive service, and new engines are equipped with every improvement likely to promote this. Steel for boilers is becoming almost universal, and boilers are being steadily increased in size, and the tendency towards higher pressure goes on. Enlarged heating surface enables engines to be run with enlarged exhaust-nozzles, which reduces the speed

of the gases of combustion, securing increased absorption of the heat. The extended front end is making rapid headway, and in connection with that arrangement many master mechanics are striving to harmonize draft appliances so as to admit of still increasing the exhaust-nozzle opening. Mr. Buchanan, of the New York Central Railroad, is making the smoke-stack casting bell-mouthed and using a single nozzle, his idea being to obtain maximum efficiency of the exhaust steam to promote draft, by making the nozzle and stack conform in principle to an injector. His experience has been very encouraging. Mr. J. M. Foss, superintendent of Central Vermont Railroad, Mr. James Meehan, Cincinnati, New Orleans and Texas Pacific Railway, Mr. R. W. Bushnell, Burlington, Cedar Rapids and Northern Railway, and others, have been laboring in lines of their own to improve the draft appliances, with gratifying results.

Anthracite coal-burning locomotives are on the decrease, for there seems to be a growing impression that bituminous coal can be burned without being offensive on any kind of trains. The practice that came in vogue with hard coal-burning locomotives of placing the fire-box entirely above the frame to secure a wider grate and increased width of fire-box, is receiving considerable application with soft coal-burning engines. The Schenectady Locomotive Works alone built 13 locomotives with the fire-box constructed in this way. If this plan is found to work as well in practice with burning soft coal as it does with hard coal, it seems susceptible of considerable improvement. The boiler could be elevated till its center is about the height of Wootten boilers, which would give fair depth below the tube line. Meehan has elevated his boilers in fast passenger-engines, merely to secure increased steadiness in running, a somewhat anomalous result produced by elevating the center of gravity; and there is no reason why it should not be made the most of when a better fire-box is the object sought.

The desire to improve on the ordinary locomotive boiler has led to several experiments during the year, where novel types were brought into service or radical changes were made on old ones. In June last the Brooks Locomotive Works finished an engine for the Chicago Coventry Locomotive Boiler Company. This engine is of the Brooks eight-wheel standard type, but it has a return-tubular boiler covered by the Coventry patent. The boiler, which is a very large one, being 60 inches diameter at the smallest ring, is divided horizontally into two compartments, both being nearly filled with tubes. In the lower part are 150 two-inch tubes which convey the gases from the fire-box to the smoke-box; and the upper section has 80 three-inch tubes which lead the gases back from the smoke-box to the stack, which is placed on top of fire-box in the position usually occupied by the steam dome. This engine has been running on the Chicago and Northwestern Railway and on the Chicago, Rock Island and Pacific Railway; and the owners claim a substantial saving of fuel.

Mr. A. J. Stevens, general master mechanic of the Central Pacific Railroad, has designed and built a locomotive-boiler with a combustion chamber in the middle of the tube space. Tubes 4 inches diameter lead from the fire-box to the combustion chamber, whence the gases are conveyed by a large number of 1¼-inch tubes to the smoke-box. Mr. Stevens' idea is, that the large tubes which the gases of combustion enter first do not suppress combustion, that the flame which would be immediately extinguished on entering a 2-inch tube keeps burning in the large tube, and the act of combustion is completed in the combustion chamber. The boiler in service has given remarkably good evaporative results, besides throwing no sparks.

Mr. Buchanan, superintendent of motive power and machinery of the New York Central Railroad, has put his water-table fire-box into the greater part of the engines built for the road during the year; and he has improved the combustion by adding pipes for superheating steam which is used to inject air upon the fire.

An examination of improvements effected on locomotives during the year indicates that master mechanics are not entirely contented with the ordinary link motion as a means of distributing steam. Several notable attempts to devise a reversible valve motion, free from the objectionable features of the link motion, have met with practical application. First among these may be placed the Stevens valve-gear. With this motion, one eccentric is used, and the lead is taken from the cross-head. Two slide-valves are employed, one at each end of the cylinder, and they are operated by separate stems which connect with a wrist plate. The leading advantage of the motion is, that when the engine is cutting off short, release can be delayed till close to the end of the stroke. For freight-engines and others with comparatively slow piston speed, the gear is found very economical. Indicator cards taken from engines having this motion, show remarkably small back pressure when release is delayed beyond 90 per cent. of the piston stroke.

Mr. Alexander Mitchell, superintendent of the Lehigh Valley Railroad, fitted up an engine which was built last year with a peculiar valve motion, the invention of Mr. George S. Strong, of Philadelphia. This engine has a steam-jacketed cylinder; and the steam is distributed by means of four independent gridiron-valves that operate vertically on seats at the ends of the cylinders. The steam and exhaust-valves are worked separately, and are so operated that admission, cut-off, exhaust and compression can be regulated for the work the engine is doing. The valve-motion resembles the Joy gear, the movements being taken from the vertical and horizontal action of the main rod. Two reverse levers are employed, which can be used together or separately, as there are two quadrants. The engine met with a serious accident which destroyed one of the cylinders shortly after she was first tried. Owing to this the engine has not done enough work to demonstrate her economical value.

Many master mechanics are improving on the plain slide-valve by adopting the Allen valve, especially for passenger service. Balanced valves of different kinds have also been put on many locomotives during the last year.

Apart from the novel forms of boilers, already mentioned as having been introduced during the year, a few other modifications that entailed changes from ordinary types have been introduced. Mr. Mitchell, of the Lehigh Valley Railroad, the inventor of the consolidation locomotive, has built, for working steep grades, some heavy engines that have eight drivers connected, and a pony truck in front and behind. The arrangement gives

a fine distribution of weight on the drivers, with a rigid wheel-base three feet shorter than would be necessary with a consolidation engine of the same size. The same prolific designer got out a neat and convenient form of double-ended, single-driver locomotive intended for inspection purposes. Mr. Stevens, of the Central Pacific Railroad, has got his long-spoken-of huge "Mastodon" ten-wheel connected engine in service, and she is doing excellent work. Although the wheels are placed so close that the tires nearly touch each other, there is a total driving wheel base of 19 feet 7 inches, but the rigid wheel base is five feet less, which enables the engine to track well on sharp curves.

The Cooke Locomotive Works have built a group of ten-wheel engines for the Elmira, Cortlandt and Northern Railroad, which have the four-wheel truck in front of the cylinders—a style that is very common in Europe, but is a novelty here.

The Mason Locomotive Works, which have been in the habit of building suburban and narrow-gage bogie engines with Walschaert motion, have changed to the link motion. Respecting the business of these works, Mr. Meats, the superintendent, writes: "We have built an unusually small variety of locomotives during the past year, made up almost entirely of the standard type. Of these we have constructed from 18x24 inches, 96-inch drivers, for heavy passenger work, weighing about 100,000 pounds, to 17x22 inches, weighing about 76,000 pounds, and have in process of construction at present some 17x22 inches, with 69-inch drivers, for passenger work, to weigh about 90,000 pounds when in running order. We have also constructed some 17x24 inches, with 63-inch drivers, for mixed service. For passenger work we have wholly used the straight stack and extended arch, some of which have been fitted with a steam-jet to expel the sparks from the smoke-arch, and some have been fitted so as to drop them into the pit. Krupp steel has been used considerably for tires, piston-rods and crank-pins, and in some cases for axles. We are now about to secure truck tires by means of his retaining rings and bolts, on a special order. Steel boilers, according to present indications, will be the rule rather than the exception for new work. Amongst the bogie engines we have constructed, I may mention a 16x24 inches, with 57-inch drivers, weighing 56,000 pounds on drivers and 10,000 pounds on pony truck. This engine, as you would suppose, has developed a high hauling capacity for its size, and excellent results in speed on local passenger work, the chief causes of its success being the free scope for a large grate area and the comparatively small amount of dead weight, together with a minimum resistance upon curves."

The most reliable official figures that can be found show that there are 29,227 locomotives of all kinds belonging to the railroads of North America. Reckoning the life of a locomotive at 25 years, it ought to require the construction of 1,169 locomotives annually to maintain the stock of engines. A great many locomotives kept on the motive-power list are doubtless out of service; but, making free allowance for this, the figures indicate that in the last year the renewals of locomotives have been far below the necessary requirements. Many of the engines built do not represent maintenance of stock, but were called for by new roads and extensions. Renewals must be made some time to fill the blanks left by wear and tear; and those who delay longest in getting their motive-power put in order, will pay heaviest for the work when it can be delayed no longer.—Angus Sinclair in *American Machinist.*

RAILWAY DEVELOPMENT IN CANADA.

MR. WEBB, Locomotive Engineer of the London (Eng.) and Northwestern Railway, stated, at a meeting of the Statistical Society, that last year the engines of that railway ran over forty-five millions of miles, which was about equal to a mile and a half every second of time, or ninety miles a minute, or around the world in every four and a half hours. He also stated that, according to his calculations, every hour throughout the year 14 cwt. of steel disappeared off the rails on that railway through wear. The London and Northwestern system comprises about 1,780 miles.

There are not less than 270,000 miles of railway in operation throughout the world, and the capital invested is fully $20,500,000,000.

Yet the first railway which carried passengers was operated in England in 1825, and was fifty-six miles in length. It was followed by a short line out of Boston, Mass., in 1827, and by the Lyons and St. Etienne Railway in France, opened 1828.

Canada's first passenger railway (there was a coal railway in Nova Scotia before, on which was used one of George Stephenson's original locomotives) was started in 1832, a charter having been in that year granted by the legislature for a railway from Laprairie, on the St. Lawrence, to St. John's on the Richelieu. The length of the line was sixteen miles. The pioneer Canadian line, the official name of which was the St. Lawrence and Champlain Railway, was popularly known at first as the "Snake line," and later as the Caughnawaga Railway, and is the one to which Sir John referred in his recent speech before the liberal-conservative convention in the opera house.

It was first worked with locomotives in 1837; and the first locomotive used was called the "Kitten," whether from its irresponsibility of action or from its liveliness of motion I know not. It was brought from Europe by an engineer, who kept it, when not at work, caged up and secreted from public view, possibly to prevent the over-curious injuring it, and thus stopping the whole railway traffic of Canada. The next imported was called the "James Ferrier," I presume after the present Senator Ferrier, whose earnest face is still to be seen in the railway committee of the commons whenever any bill affecting the Grand Trunk Railway's interests is up for repair in that great work-shop of the commons of Canada.

The capital of the St. Lawrence and Lake Champlain Railway was $200,000.

The summer travel to New York from Montreal passed entirely through the Champlain canal in passenger-boats drawn by horses—a fact which may explain the early construction of the St. Lawrence and Champlain Railway, which in those days ceased to run when navigation closed and the Lake Champlain steamers ceased to ply.

The first railway return presented to the legislature of the province of Canada was the return made by this railway in 1844. That return gives the following facts con-

cerning our first railway: No. of miles in operation, 16; No. of passengers in the year, 27,118; No. of tons freight carried, 12,636; Gross receipts for year, £15,230; Expenditure, £11,851.

Since his public career began, Sir John McDonald has seen the sixteen miles grow to nearly 10,000 miles; the modest $200,000 invested in railways become fully five hundred million dollars; the passengers carried increased (in 1883) to 9,580,000; the tonnage of freight handled expand to 13,266,255 tons (in 1883); the total year's receipts develop from $75,000 to $38,244,585, and the total year's expenditure reach the sum of $24,400,000. The solitary "kitten" that playfully tumbled between St. John's and Laprairie is now represented by 1,358 of a locomotive progeny.

The total receipts by the railways of Canada in 1883 were within $300,000 of the aggregate trade exports and imports of the four provinces of Upper and Lower Canada, New Brunswick, and Nova Scotia, and Prince Edward's Island in 1844.

A glance at the map will show how well the peninsula of Ontario has been plowed up by the network of railways which, if it has spoiled some picturesque scenery, gives employment the world over to close upon a million employés. The Ontario peninsula is as well networked with railways as any part of the continent, and passage is easy and rapid between the chief towns of all Canada. Yet a generation has not passed away since representatives from Toronto and west of the Queen City wanting to attend legislative duties in Quebec after navigation closed, found that their best and quickest route was to go to Buffalo and take train along the south of Lake Ontario, and thence to the Citadel city.

The sister province of Quebec had not made as rapid progress as Ontario up to the time of confederation, when (in 1866) the province of Canada had 1,968 miles of railway, 1,393 of which were in Upper and 575 in Lower Canada. But she has made good progress since then, and in 1883 had as many miles as Upper and Lower Canada together in 1866, while the total completed and projected in that province amounted to 3,900 miles.

Taking the railway development of Canada as a whole, we find that since the confederation year the growth has been rapid.

From 1868 to 1878 the traffic receipts increased at the rate of $902,000 a year.

From 1878 to 1883 the traffic receipts increased at the rate of $2,544,900 a year.

From 1868 to 1878 the number of passengers carried increased at the rate of 352,392 a year.

From 1878 to 1883 the number of passengers carried increased at the rate of 627,200 a year.

From 1868 to 1878 the tons of freight carried increased at the rate of 562,347 tons a year.

From 1878 to 1883 the tons of freight carried increased at the annual rate of 1,078,557 tons.

From 1868 to 1878 the capital invested in railways increased at the annual rate of $17,821,218.

From 1878 to 1883 the capital so invested increased at the rate of $31,532,000 a year.

It may be well to note that the increase of late years has been even more rapid in the middle period since confederation. During the years 1875, '76, '77 and '78, four years, the tons of freight carried on our forty-eight or fifty railways amounted to 26,265,441 tons, or an average per annum of 6,566,360 tons.

During the period 1879, '80, '81, '82 and '83, five years, the tons carried were 48,846,233, or an average per annum of 12,211,560 tons.

The increase of 1878 over 1875 was 2,793,056 tons. The increase of 1882 over 1878 was 5,382,793 tons.—*Montreal Gazette.*

TICKET COMMISSIONS.

THE question of ticket commissions is one of the most important that can come before railway men for determination. The magnitude and extent of the evil and the numbers and power of those whom self-interest makes its friends, are alarming features. Sooner or later the task of suppression must be undertaken and, if once boldly grappled with, the issue is not uncertain. Believing the present a most auspicious time for undertaking the good work of abolishing this pernicious practice, we have persistently urged railway men to unite and begin the fight.

The great objections to the practice of paying commissions are its expensiveness, its uselessness and its demoralizing tendencies.

In his circular, calling a meeting of the representatives of railways in the Southern and Western Associations to consider this subject, Mr. S. F. Pierson, Assistant Commissioner of the Trunk Line Pool, gives some facts showing the startling proportions of ticket commissions. He states that the amount thus paid out "has become a severe tax upon the revenues of the railways. This tax is stated by a number of roads to be not less than 20 per cent. of their entire receipts from competitive passenger traffic, while some roads estimate it to be much higher, and there are individual cases where the commission is equal to 46 per cent. of the receipts from the business upon which it is paid." He further says that it is thought "that no legitimate business ought to endure such a drain upon its revenues to secure at best, in many cases, only an unstable neutrality."

From paying commissions at a few important offices, the practice has increased, until in large cities scores of brokers are paid disproportionate percentages and the agents in every small town receive a stated amount on each through ticket, in addition to the gratuities or cap commissions given his subordinate in charge of the local office. In order to secure his fee the agent is often induced to discriminate against the road employing him, and send travel over competing lines. Every important road keeps from four to ten, or more, traveling passenger-agents whose business it is to go from office to office and coddle, bribe or otherwise cajole the local ticket-agents.

The practice is practically useless. If every road pays the same commission on the same kind of tickets, wherein are any profited? In order to persuade the agent to discriminate he must receive special inducements from one company; this, when discovered, leads to a rise on the part of the others and so all are constantly bidding against each other and conducting secret consultations with the ticket-seller, the effect of which is to constantly advance this kind of compensation. It may be alleged that the ability to pay ticket commissions is a club in the hands of

small and weak roads, whereby they can force older roads to give them a proper share in the business when pooled. Admittting that this is true, is not the same advantage to be obtained by means of differential rates?

The demoralizing tendencies of paying ticket commissions are many, and most of them are so irritating and hateful that it is hard to understand why they have been endured so long. We have stated that one effect of ticket commissions is to induce local agents to discriminate against their employers. For example, the agent of the Michigan Central at Kalamazoo sells a ticket from that place to Buffalo, over the Central to Detroit and the Grand Trunk from Detroit to destination, in order to get the one or two dollars commission paid by the latter road. This sort of action is very common and is provoking as well as dishonest. The confidential nature of the ticket commission business and the difficulty of finding out just what each road does actually pay, lead traveling representatives to offer percentages not sanctioned by the agreements of their roads and those competing with them. The only way a General Ticket Agent can discover this fact is by noticing the falling off in the sales of his tickets at certain points.

Paying commissions gives local agents the dangerous powers which some of them are apt to exercise. One of these is the ability to cut rates and secure the business by a division of his commission, but the more pernicious is the temptation to make insolent demands upon roads for an increase of the commissions allowed him. Suppose that these demands are acceded to, in time new ones will be made: if the action of the agent is reported to his employer and a discharge follows, then the discharged employé, when he drifts to a similar employment with another road, naturally revenges himself upon the road reporting and the one discharging him. In either event loss results.

Ticket commissions are the life of the scalpers. None are simple enough to suppose that these brokers thrive by buying and selling tickets purchased by travelers at regular offices; their stock comes from the general ticket offices, with the heads of which they are on intimate terms. If rates are to be cut, a nod does the work, or, when an apparent good faith is to be maintained, the same result is attained by allowing a commission sufficient to enable the scalper to divide with the purchaser and thereby sell at less than regular rates. This sort of business is unfair to the public as well as unjust to competing roads.

Nearly all railway wars have originated in the trickery of passenger agents who, to secure a few more passengers, have paid enormous commissions or resorted to underhand dealings with scalpers. If these ticket commissions could be abolished, scalping offices would be compelled to shut up and then, if a thorough system of pooling and differential rates were to be adopted, there would be no motive for cutting rates, and such action would never be tolerated.

How can ticket commissions be abolished? We can suggest a plan. Let the trunk lines of the country resolve to discontinue the practice, and then honestly carry out their resolution. If the large systems were to take this step the smaller lines would soon swing into line, and the result would be an accomplishment of the hopes so long entertained. In cases where justice demanded it, proper differential rates could be allowed.

The greatest obstacle to the adoption of this plan is the mutual distrust of the representatives of the lines interested. Each fears that the agreement would only tempt some one of his rivals to send out men on the sly to offer commissions on the sale of his tickets, and thus the only effect would be to aggravate the ticket-agents and scalpers and excite hostility, without producing any lasting beneficial results.

This objection should not prevail. If General Passenger Agents cannot be made to keep their word, they ought to be dismissed; we are loth, however, to believe this imputation upon their honor, although we know a few who, being naturally cunning and knavish, would surely violate pledges, unless their General Managers interfered.—*Railway Register.*

"FREE PASSES."

WHEN the critics enumerate the sins and follies which they say characterize the management of railways, in this country particularly, they place prominent in the category the practice of issuing free passes—that is, unless they happen to be recipients of passes themselves. Even in the elaborate and generally fair report of the government directors of the Union Pacific Railway, the subject is referred to as follows:

"The Union Pacific has the reputation of being exceptionally conservative in the matter of granting free passes. A statement of those issued during the year last past—'trip' passes only, and not including 'annuals'—shows that the lowest one week's issue was $13,772 and the highest $21,452. The computation is upon the basis of the regular passenger tariff rates. Measures to correct are demanded, and, it is gratifying to say, have been inaugurated."

The inference from these figures of course is that the railway named is giving away every week from $13,722 to $21,452 of its revenue in the form of free passes. When it is remembered, however, that a very large part of the traveling done on these passes would not have been done without them, it will at once be seen that the figures are misleading and of little real significance. Only so far as the passes were used by persons who would otherwise have paid their fare do they affect the company's revenue, as the same trains and the same number of cars would be run if there were no "dead-heads" at all. The object of this article is not to advocate the free-pass system, but to defend railway officers from unjust criticism in this respect, by showing some of the reasons and influences which impel the railways to bestow the privilege of free transportation. Two of the most potent of these influences are suggested, unintentionally, in the report just referred to, by the following sentences immediately after the words above quoted: "It is within the knowledge of the government directors that the president and general manager recognize the necessity of popularizing the road so far as they may, though the obstacles in the way are numerous. It is a constant fear of adverse legislation on the one hand, and the constant determination on the part of the public to have remedial legislation on the other, that tends to render railway securities of uncertain value, the operation of roads uncertain of success and greatly increased in difficulty to their management."

"The constant fear of adverse legislation" is—it may

as well be admitted—the reason for the existence of a very large share of the free passes that are issued. It is a notorious fact that the most persistent and extravagant demands for passes come from men holding political offices, from aldermen and town, city and county employés of every grade, up to State and national legislators and officers. Here is where the clamor and threats of demagogues against railways come into advantageous use. Every office-holder and office hanger-on, from little to big, knows that the railways have been placed absolutely at the mercy of the lawmakers, and that the most monstrous exercise of legislative power in fixing rates, even to the robbing of railway owners of all return whatever upon their investments, must be submitted to, even without the possibility of appeal to the courts. Knowing, therefore, that the railways fear their enmity and will not dare to refuse their requests, the politicians use their power to obtain transportation for themselves, their families, their friends and often their business acquaintances, and railway managers submit to this species of blackmailing because they feel that they must. Occasionally laws have been proposed—but not passed—making it a crime for railways to give passes to any public officers. This is beginning at the wrong end. Laws forbidding public officers and servants to accept or use free transportation on any railway, would take the burden from the railway officers, who now act under a species of compulsion, and place it where it belongs—upon the men whose power to secure passes rests solely on the fact that they are, in some way, representatives of the terrors of the law. It would be an immense relief to railway managers if the responsibility of incurring the enmity of the office-holding class could thus be taken from them, but it is safe to say that the recipients of passes will not be likely to enact laws prohibiting the further enjoyment of one of the most prized perquisites of political life.

"The necessity of popularizing the road," to which the governmental directors allude, is another strong reason for the giving of free transportation, especially where competition exists—as it now does almost everywhere. The railways depend on the public for their business, and their officers have to exert themselves in every way to secure the public favor, through the press, through large shippers and through other influential men. Hence, while the giving of passes to "popularize the road" and increase its business has been carried, often, to a deplorable extent by the railways as a whole, still it is for each manager to determine whether or not it "pays" in his own case—that is, whether he gets more business and more profit in the end by giving passes than he would have got if he had refused to give them. Happily, of late, competing lines have made and, to a large extent, lived up to agreements not to issue passes to influence freight business, and thus the pass evil has already been diminished to a considerable extent.

Transportation given to the newspaper press hardly should come under the head "free," for, as a rule, more than an equivalent is rendered for it. The influence of the local press in aiding the organization and construction of railways, and in making their advantages and facilities known to the public after they are set in operation, is hard to measure. Even here, however, there is of course opportunity for imposition and unnecessary annoyance, but on the whole it is not likely that the railways lose any money by being liberal in the matter of transportation to the press. In the case of newspaper men, perhaps even more than in that of politicians, it should be remembered that a very small part of the traveling indicated by passes would be indulged in if it cost money.

"Exchange passes" to other railways form a very large percentage of the total number of annuals, and trip passes to officers and employés of other roads are also numerous. These are ordinary business courtesies for which the recipients are supposed to, and as a rule do, reciprocate. Generally they are issued to those who are obliged to travel on other roads on business for their own companies, and so they save each company from cash expenditure on this account. In other words, the roads pay each other for transportation in kind, instead of in money—a mutually convenient and economical operation. Under this head should be mentioned the passes issued by all roads to the ticket agents of other roads almost without limit, in order to secure the good will or, at least, neutrality of these agents who, by reason of their direct contact with the traveling public, are supposed to be potent for good or ill toward any road. This variety of pass-giving savors very much of that to politicians and office-holders—a compulsory rather than a spontaneous giving, to avert evil rather than to secure good. Nevertheless it is sanctioned by custom and perpetuated by competition, and until all the railways effect some binding agreement with each other in this regard, it is useless to criticise their officers for adopting the same methods for securing business which their competitors employ.

Charitable, benevolent, religious and public-spirited objects demand and secure an amount of free transportation from the railways which would aggregate an enormous sum every year, if computed at its actual money value. The disposition to find fault with the railways has become so general that very little credit is given them for this kind of work which they are, nevertheless, constantly called upon to do, and which they do most generously. If the giving of free transportation were absolutely prohibited, as some have proposed, public and private benevolence would be very heavily taxed to pay the railways for transportation now voluntarily and liberally given. Let the recording angel make a note of this to the credit of these corporations, which are popularly said to have no souls.

Other varieties of claims for free transportation might be named, but the foregoing will suffice to suggest some of the reasons why the practice of issuing free passes, which is often so fiercely and unreasonably denounced, continues to exist, and also to show some of the embarrassments which surround railway officers in attempting to control and diminish what, if an evil, is at least an evil with many and great mitigations.—*Railway Age.*

IT was at a railway station. The trains were being made up. Puff went the locomotives, whirr went the wheels, and the whistling was terrific. They were backing and forwarding and all manner of shunting on a labyrinth of rails. "What are they doing?" "Practicing for an accident!"

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A STEADY IMPROVEMENT.

IT is a pardonable source of pleasure to us that our efforts to conduct the JOURNAL as a monthly railway magazine and review have met with a cordial recognition, and that the character of its contents has been uniformly commended. With the present issue—the ninth since the change in management and policy—we publish four more original contributions, making a total of thirty-eight during the period. But on this occasion we take a special pride in calling attention to the nature of these contributions. The four published this month, we are prepared to submit not only as an exponent of the future character of the JOURNAL, but also as an indication of the steady improvement manifested in our contributors' department, which improvement, we trust, will continue indefinitely.

We are fully aware that the past year has not been a favorable period for attempting new features in journalism, nor has the condition of the railway industry been such that rapid success awaited well-directed efforts in behalf of the interests involved, but none the less has our endeavor to establish a railway magazine and review met with encouraging results, and we are content to bide our time for a still greater appreciation of the value of the JOURNAL. In this connection we may again say that in two ways we can never be over-supplied—with able contributions on railway topics, or subscribers. The former may look for liberal remuneration for their literary efforts, and the latter for an adequate *quid pro quo* in the monthly receipt of the JOURNAL.

RAILWAY LEGISLATION.

MORE than once have we had occasion to comment upon the unfair treatment of railway interests in our national and State legislatures, and doubtless the subject would be threadbare were it not for the uncertainty always existing as to the quarter from which the next attack on railways might be expected. The frequency of these attacks and their usual abortiveness render them to some degree comparatively harmless, but the continual subjection of railways to a position of defence, greatly harasses railway progress, and discourages the capitalist from railway investment.

It may be admitted that on various occasions railways have influenced legislation, and that bribery of legislators in the interests of railways is a not uncommon occurrence; but it may be truthfully said that this bribery, in nine cases out of ten, is a species of blackmail wrung from the treasury of the roads by smart and unprincipled members of legislative bodies. Were it not for the uncalled-for attacks upon railway interests, unjust and burdensome taxation and unwarranted interference with the conduct and

management of railways, the corporations would be perfectly willing to avoid the legislatures, save on such occasions when they might rightfully endeavor to obtain certain concessions and privileges. Anti-monopolists are all very well in their way, but it would be a pleasing spectacle to see them, for once, divert their energetic philippics from railway and kindred interests, and attack the greatest of all monopolies—the monopoly of bribery—which is at present controlled by our legislators.

Far be it from us to insinuate that every measure designed to limit and abridge the privileges of railways emanates from a desire to extort money from their coffers. There are doubtless many honest and well-meaning men who think they are pursuing the strict path of duty when they direct their endeavors in anti-railway channels, but from a utilitarian point of view, their honest thick-headedness is quite as harmful, if not more so, than the roguery of their smarter colleagues. It matters little whether it is from ignorance or dishonesty that railways are forced to battle for their privileges; the struggle between corporations and individual legislators inevitably redounds to the evil of the former, even though they gain a temporary victory, and the right or wrong position of the corporation has but little effect upon this result. The constant defensive attitude of a corporation puts it much in the light of an unfortunate man who is, through the force of circumstances, brought frequently before a court to clear himself of charges of which he is innocent. His innocence may be infallibly proven on every occasion, but his constant appearance in the defensive, while at first arousing sympathy will eventually awaken prejudice. And while railways and other corporate industries may successfully resist injustice, a time comes when the frequency of their defence will tend to prejudice the public mind against them, on the ground that such constant appearance must indicate a weakness in their case. If we are not mistaken this prejudice has already arisen, and it will require greater exertion to dissipate it than it did to create it.

Possibly some comfort may be drawn from the reflection that these attacks on railways are an indication of the peace and prosperity of our country, inasmuch as they tend to prove that our legislators are at a loss to find weighty grievances on which to legislate. They are paid salaries and must needs render service in return, and therefore the railways are seized upon as legitimate game. The village Solon, with aspirations toward office and attendant honors, sees a cheap glory to be obtained in fighting the railways and thus proving his "incorruptibility"—until the railway stops his mouth in sheer self-defence, and then he is most likely to do greater harm to the corporation in posing as a corruptionist. It is safe to say that the railways would only be too willing to dispense with "friendly" legislators, if they could do so with the certainty that the latter would remain neutral. The difficulty is that in the mind of the average lawmaker, there is no middle ground where railways are concerned; they must either be pro or anti-railway men, and they will be either for a price. In the one case the price is cheap fame, in the other hard cash, and the hard cash will carry the day every time—if there is only enough of it.

It does not seem much to ask that railways may be treated as individuals, which their corporate charter demands, but how often do they figure in this light? In a straight hand-to-hand encounter between a railway and a legislature, putting aside all question of undue influence, how often will the corporation be as justly treated as would a single individual? The railway is regarded as a species of legislative foot-ball, fired from one side to the other and treated with no great degree of gentleness, but if it amuses the players and allows them to make "scores" no one complains—unless it be the railway itself, and its complaint would only be regarded as an indication of its corrupt nature. This legislative foot-ball is a great game for everybody but the ball.

DISCRIMINATION BETWEEN PASSENGERS AND FREIGHT.

THE two branches of railway traffic, passenger and freight, differ widely. While the questions of mileage and competition enter into the consideration of both, they must be viewed from entirely different standpoints as revenue-producing items. It requires little discernment to understand that the cost of transporting passengers is relatively much greater than in the case of freight; and no one will argue that because freight can be transported for a fraction of a cent per mile on every hundred pounds, passengers should be carried at the same rate. The railway equipment, the rolling-stock necessary to the transportation of passengers, and the attendant train-service, are far more costly to construct and maintain than the similar equipment for freight-carriage, and naturally the transportation of passengers is conducted at higher rates than freight, if it is to be conducted at a profit. This much is clear and calls for no explanation.

But to the average traveler this disproportion of rates may seem greater than is warranted by the actual difference between the relative cost of passenger and freight transportation, and were there no other questions involved than the simple difference in the cost of equipping and maintaining the passenger and freight "plants," such objections and complaints would be justly founded. In reality there are more cogent reasons than this why the disproportion should be great. It matters little whether the freight or passenger traffic of any one particular road is the greater source of revenue; the latter may even be conducted at a positive loss. Nevertheless the freight traffic must always be subordinate to the passenger traffic.

If there are delays in the running of trains and consequent detentions, the first considerations must be for the passenger trains. The freight may be of a perishable character, but if one or two trains of either class must be detained on a siding for several hours it must be the freight train, even though the passenger train may contain but a handful of passengers. To give this precedence to one class of traffic naturally increases the cost of conducting this branch to a considerable extent. Again, the requirements of freight traffic are far less pressing than those of passenger traffic. Even in the transportation of freight between two great cities the actual number of daily trains run will not exceed one or a few at the outside. Instead of running, as in the case of passenger traffic, a dozen or twenty trains a day of a few cars each, a freight train may consist of a great number of cars drawn with but a single engine, and costing scarcely more for its transportation that would a train of a few cars. In no case does the maintenance of freight traffic call for a greater number of trains than the actual bulk of freight demands, yet a road that conveyed passengers on this principle would be rightly subjected to criticism. Passenger trains must be run, not so much with a view to the actual number of passengers carried, but to the requirements of these passengers, whether they be few or many. A number of trains, even on trunk lines, are run at an actual loss in order to afford the necessary train accommodation to the patrons of the road, and for this action on the part of the railways the public are rarely grateful and generally clamor for still greater accommodation.

In order to convey travelers safely and comfortably, the road-bed must be kept in perfect order, and the items of track-construction and repairing reach large amounts. The maintenance of passenger stations with their lighting and heating, to say nothing of the cost of construction, are burdensome and permanent sources of expense; and the employment of the necessary working force incidental to passenger traffic is a far greater item of expense than that attendant upon the employment of freight-hands. The maintenance of schedule time in passenger trains, the frequent changes in time-tables, even the comparatively small items of printing and stationery, tend to increase the disproportion of the relative expenses, and while it is perhaps difficult to estimate upon the exact proportional difference between the actual cost of passenger and freight traffic, it is easy to comprehend that this disproportion is very great.

The public are fond of grumbling, and they have exercised their powers in this direction ever since railway travel became a successful and established achievement; but while in many instances there may be just ground of complaint against railways, in general they are founded on no grounds at all. More especially is this true when we consider the perpetual cry for lower rates of fare, which is made irrespective of the cost of conveyance to the roads themselves. When we reflect that but a little more than a half-century ago the only means of extended travel was by cumbersome stage-coaches traveling at a snail's pace and charging rates per mile that the most grasping and unscrupulous railway management would blush to mention, we are seized with a mild wonderment at the unreasonable and exacting nature of the average traveler. In his own lifetime he has seen a wonderful change in traveling methods, and at one-half and one-quarter the expense he may travel in one-tenth the time, a distance that fifty years ago was considered an extended journey. Nevertheless he is not satisfied and clamors for greater speed and cheaper fares. Grumbling is a national institution we are fully aware, but we honestly believe that if the average grumbler would quietly reflect upon the manifold blessings conferred by the nineteenth century upon its children, he would concede preëminence to railways and conclude that he had far less cause for complaint than for thankfulness.

EDITORIAL NOTES.

THE *Wall Street Daily News*, a bright financial daily paper of this city, has been indulging in an attack upon some questionable operations of Messrs. GOULD and FIELD, and these gentlemen have nobly retaliated by shutting off the *News* from sale at the stations of the elevated roads. We do not feel called upon to extend our commiseration to the publishers of the *News*, for they are rather in a position to accept congratulations. When such mighty men as Messrs. GOULD and FIELD disturb themselves sufficiently to attempt to "squelch" anybody, the "squelchee" generally acquires a most enviable notoriety and popularity. No doubt these influential personages would like to shut off every publication that animadverts upon their methods from sale at the elevated stations, were they not refrained by the certainty that by so doing the patrons of their roads would be left with but a meager supply of reading matter.

* * *

NEW JERSEY has finally realized that a State tax may be necessary. For many years she has thrived and flourished upon the taxes levied upon her railways, but her requirements increase faster than the railways' taxable property. It is a shame that the State should be permitted to bleed its citizens, while the grasping roads have yet a little blood, but it is comforting to know that new plans have been started for a further raid upon the railways. Not often are they allowed to rest in peaceful security.

* * *

THE REAGAN Inter-State Commerce Bill, over whose provisions the country has been greatly interested, and whose unjust discriminations have awakened wide-spread

condemnation, has died a peaceful death in the Senate, and a juster bill has been brought forward instead. Once in a while a bill like the Inter-State Commerce Bill will accomplish some good, in showing the absurdities of legislation that will creep in during a session of Congress; but beyond this the warm debate expended on the bill has gone for naught. Still, that is but a small matter. Perhaps it wasn't worth much.

* * *

IT must be borne in mind that Congress has but twenty-two subjects on which to legislate, and sometimes the supply of legislative material runs dry. The tariff is a ticklish subject, and so is the silver coinage. There is a natural aversion to passing appropriation bills all the time, and once in a while some legislative diversion must be had. The REAGAN bill was an instance.

* * *

HAVING obtained what is considered more reasonable appraisement in New York City, the elevated roads have returned to their former headquarters, but it seems as if their recent *coup d' etat* may not result as satisfactorily as expected. Having for a portion of the year been located in Westchester county, it is now claimed that they are liable to taxation in that county, thus subjecting them to a double tax. There may be too much cleverness occasionally.

* * *

THE New York Stock Exchange is highly indignant because the Mining Exchange has announced its intention of dealing in stocks and bonds in small quantities. Fortunately the prosperity of the country is in no way involved in the differences between these two highly respectable organizations, and the public at large is supremely indifferent. Wall street has "lost its grip," so to speak, and is not liable to regain it for many years to come, a fact by no means to be deplored, save by the "street."

* * *

THERE really does appear to be an awakening of trade and commerce, and despite the dull forebodings with which the present year was ushered in, the advent of Spring may see a general revival. Over-production, which seems to be universally admitted as the cause of the present depression, is a serious evil, but of all causes of depression it is briefest in its effects.

Wanted.

A LIBERAL price will be paid for Vol. XIII of the AMERICAN RAILROAD JOURNAL, and also for volumes from Vol. XVI inclusive, to date. Single copies are also wanted for October 8, 1881, October 15, 1881, January 14, 1882, and June 30, 1882. Please address this office for terms.

Grease and Grease-Cups.

[COMMUNICATED.]

Editor American Railroad Journal:

DEAR SIR:—Replying to an article in your paper on Grease and Grease-Cups, we would call your attention to the following, taken from the *Wood-Worker*, of Indianapolis:

"Last month we reprinted an article from the AMERICAN RAILROAD JOURNAL on automatic lubricators, oils, grease and grease-cups. The article stated that grease and grease-cups could not be a success, because they depended for their operation upon the frictional heat of the bearing to be lubricated being sufficient to melt the grease, before it would cover the parts in fractional contact; and that, as heat in metals means expansion, the bearing was very liable to be injured. This statement brought Mr. Ed. Byrkit, superintendent of Coburn & Jones' planing-mill, this city, to our office, with the statement that he had found a grease and cup for feeding it, that not only did not depend upon frictional heat for its operation, but was open to no objection whatever that he could observe. He has run it several days on an eight-inch box on a large planer, using only one cup, and it had required little or no attention and kept the box and spindle in excellent shape.

"The cup and lubricant are made by a Milwaukee firm. Mr. Byrkit informed us that several other firms in this city had placed them on high speed wood-working machines with equal success. We had always held the same opinion as the writer of the article referred to, but must, of course, be convinced by such practical illustration that such opinion was incorrect."

We supposed that the prejudice heretofore existing regarding the use of lubricants, had been entirely overcome, but it seems there are still a few that doubt.

Yours respectfully,

WADHAMS, MAGIE & CO.

MILWAUKEE, WIS.

[We forwarded the above communication to Mr. E. F. Dieterichs, the author of the original article published in the AMERICAN RAILROAD JOURNAL, and he sends us the following in reply.—ED.]

Editor American Railroad Journal:

DEAR SIR:—In the article, Grease and Grease-Cups, published in the *Wood-Worker* and sent to you by a correspondent, the publisher says, that in an article reprinted by the *Wood-Worker* from the AMERICAN RAILROAD JOURNAL the following statement had been made:

"That grease and grease-cups could not be a success, because they depended for their operation upon the frictional heat of the bearing to be lubricated being sufficient to melt the grease before it would cover the parts in frictional contact, and that as heat in metals means expansion, the bearing was very liable to be injured."

That this statement brought the superintendent of a planing-mill to the office who stated that he had found a grease and cup for feeding it, that not only did not depend upon frictional heat for its operation, but was open to no objection whatever that he could observe. He had run it several days on an eight-inch box on a planer, using only one cup and it had required little or no attention and kept the box and spindle in excellent shape, and that other firms had placed them on high speed wood-working machines with equal success.

This is followed by the remark: "We had always held the same opinion as the writer of the article referred to, but must of course be convinced by such practical illustration that such opinion was incorrect."

If *Wood-Worker's* opinion had really always been the same as that of the writer of the article on "Lubricating and Lubricants," it would not have been so easily changed by those so-called convincing practical illustrations. If I had allowed my opinion to be changed as easily, I would have been obliged to change it very often, and finally retire behind no opinion at all, long ago. I have frequently had occasion to notice that intelligent mechanics, after a short and injudicious trial and hasty observation would condemn a grease or oil, which a like number of equally capable mechanics claimed to be lubricants of best quality, and adopt the very kind of lubricant after some time when convinced of their error. Thus are opinions rashly formed.

Much depends on the quality of grease or oil, and the efficiency of the cups to suit peculiar characteristics. To determine their respective efficiency and real value requires intelligent and patient observation, and injury caused to machinery or bearings would have to be of the grossest character to be perceptible to observation in so short a space of time.

The statement that grease used on a bearing did not depend upon frictional heat to enable it to lubricate is only a statement, but no proof. It would be a sorry matter if the heat produced and required to liquefy the grease were to be so formidable as to be perceptible without closer observation. Grease has to depend on an increase of temperature to limpify sufficiently to diffuse itself through a central feed-hole and all over an eight-inch bearing, to equal oil already limpid when applied. Grease can be and is used to great advantage in many cases, but it is erroneous to

claim its merits as a universal lubricant equal or in preference to oils. The articles on "Lubricating and Lubricants" published in the JOURNAL, have a bearing to each other and should not be judged separately.

As to the closing remark of your correspondent's communication:

"We supposed that the prejudice heretofore existing regarding the use of lubricants have been entirely overcome, but it seems there are still a few that doubt."

I am at a loss to understand the meaning, unless complaint is intended thereby over some one's prejudice against some particular lubricant, grease and cup, of somebody's selling or manufacture, as most assuredly no part of my writings on "Lubricating and Lubricants" could be construed by anyone as indicating prejudice or doubt on my part as to the using of lubricants, which, on the contrary, I consider to be indispensable; and I have always most emphatically claimed that lubricating is one of the most important factors in manufacturing and railroading.

Very truly yours, E. F. DIETERICHS.

CLEVELAND, O.

THE Steelton *Reporter* of January 31st says of the Pennsylvania Steel Works: "All the departments of the Pennsylvania Steel Works were in full operation this week. The Bessemer mill last week produced 3,535 tons of steel ingots. The rail mill last week turned out 2,305 tons of various patterns of rails. The mill this week was on 70s. sec. 46; 60s. sec. 5, and changed rolls yesterday to 80s. street-car rails. The frog, switch and interlocking departments are very busy, and orders are being booked every day. The work on the system at Relay, on the Baltimore & Ohio Railway, is progressing very rapidly. The problems presented in devising the locks of the interlocking mechanism required for this system were as difficult as ever presented, but have been satisfactorily overcome by Capt. A. G. Cummings, the engineer of interlocking appliances, and it is probable that this apparatus will be examined with great interest by persons interested in the science of interlocking. This department is working part of their forces at nights on hurried orders. Two new planing machines were lately put in operation in the frog department, which are very handsome and first-class machines. The merchant mill this week has been running 25 and 30 pound rails on the 20-inch train, and 2⅛ rounds on the 13-inch train. Mr. Marshbank, who had the contract for putting in the heating apparatus at the government buildings in Washington city, says that the pipes cast by the Pennsylvania Steel Company were the most perfect castings he ever handled; not a blemish or a misfit was found in the entire lot of pipe furnished."

THE maxim that "the best time to engage in any business is when things are at their worst" has been illustrated by the great Patent and Enameled Leather Works of E. H. Reynolds & Co., Newark, N. J. This eminently successful house was established in 1836 under the firm name of Jos. Ward & Co., and through all the mutations of nearly fifty years has held its place at the head of its line of specialties. It was the first house to cater to the wants of upholsterers in patent leather, and for more than thirty years has enjoyed extensive patronage from that trade. Railways and car-builders have been among its best customers, and no firm in the country is more firmly entrenched in the esteem and confidence of its correspondents. Messrs. E. H. Reynolds & Co. are prepared to take orders of any magnitude, and have facilities for executing the same. Visitors are always welcome at their large establishment in Spring st., Newark, where they will be given every opportunity to inspect thoroughly the work of this well-known house whose age is a guarantee of its reliability.

Japanese Railways.

THE total number of miles of railways now in actual operation in the Japanese empire is estimated at about 260, the most important of which are these: From Tokio to Yokohama, 18 miles; from Kobe to Otsu, 60 miles; from Nagahama to Sekigahara, 10 miles; from Nagahama to Tsuruga, 25 miles; from Tokio to Tagasaki, 75 miles. All these, save the last mentioned, belong to the government, and are under the superintendence of the imperial railway department. There are also fifty-six miles in Hokkaido, in Yezo, and a few miles at the Kamaishi iron works. The line from Tokio to Tagasaki, which has been recently opened to the public, belongs to Nippon Tekiodoguaisha (Imperial Japanese railway company), and the work of constructing the track and the general management of the traffic were and still are entirely in the hands of government employés, the company being only the paymaster. So far as the general traffic management and the number of persons employed are concerned, the company has absolute authority to make restrictions; but in its present state of infancy the assistance of the government is questionably a necessity. The mutual agreement between the shareholders and the government is, that in case of the railway not paying 8 per cent. interest per annum, the latter should make up the deficiency, whatever it might be. In February, after the line had been opened 157 days, the company entered into close calculations, and found that they had earned at the rate of 12.-537 per cent. per annum, and thus needed no assistance from the government.

Both the government and company lines are built on the gage of three feet six inches, which is the standard gage of Japan. The road at Kamaishi Mines is built on a two foot nine inch gage. The longest tunnel in Japan pierces Mount Yanagure (Nanagure Yama) between the provinces of Nagahama and Tsuruga, and is 1,390 yards in length. The tunnel was cut through on the 16th of November last, after five years' work, and the bricklaying is expected to be finished some time this Summer. The sharpest curve is twenty chains, or 1,320 feet, and the heaviest gradient rises one foot in forty. The ties are mostly of chestnut, laid at a distance of two feet nine inches apart, with the exception of the joints, where they are laid two feet apart. The iron rails, imported from England, weigh sixty pounds a yard, and the steel rails, which at the present time are principally used, weigh sixty-one pounds a yard. The Tokio and Yokohama line is built of double-headed rails; almost all the rest are flat-bottomed and fish-fluted at the joints.

Classification of Cars.

THE Cincinnati *Times-Star* says: There are more different cars on the tracks to-day than one supposes. The following list is nearly perfect, and will prove quite satisfactory:

Passenger Line.—Common cars, smoking-cars, sleeping-cars, Pullman cars, Wagner cars, Woodruff cars, Mann boudoir-cars, buffet-cars, Leighton cars, Leve & Alden cars, Southern sleeper, Worcester cars, palace-cars, dining-cars, parlor-cars, hotel-cars, president's car, vice-president's car, directors' car, private car, superintendent's car, in-

spection-car, reclining-chair-cars, emigrant-car, combination car, hermaphrodite cars, observation-car.

Baggage Department—Baggage-cars, mail-cars, postal-cars, express-cars.

Freight Department—Circus cars, theatrical cars, gondola-cars, coal-car, lumber-car, grain-car, cattle-car, hog-car, sheep-car, chicken-car, stone-car, dirt-car, gravel-car, construction-car, tool-car, bridge-car, way-car, flat-car, freight-car, caboose (conductor's office) freight, meat, or refrigerator-cars.

The best car on the road is the "p-a-y car."

The Mersey Railway.

THE whole length of the tunnel under the river Mersey, which is 1,300 yards from quay to quay, is now arched in, and the greater part of the land approaches finished, so that the laying of the permanent way will shortly commence. The total length of the line will be 4½ miles, independent of some extensions now proposed. It runs from the London and Northwestern and the Great Western joint lines at Birkenhead to the Central Station at Liverpool, the course being chiefly under the streets in the land portion. The underground parts of the stations are in a forward state. The hydraulic machinery for lifting train loads of passengers, the machinery for mechanical ventilation, and the locomotives and carriages are in course of manufacture. It is expected that the railway will cost half the mileage rate of the Metropolitan Railway, and that the main line of three miles will be opened about June next.

The Rocket.

THE following letter, signed "Robert Stannard" appears in the London *Engineer:*

"The sketch made by Mr. Nasmyth represents *not* the 'Rocket,' but the 'Northumbrian'—except that it does not show an awkward projecting step attached to the leading end of the latter engine's tender, against which my father one day tore his knee and was slightly lamed for life, and that there were, I think, no funnel stays on the 'Northumbrian.' At any rate the sketch is nothing like what the 'Rocket' was in 1830.

"The 'Rocket' which ran on the day of the opening, and subsequently, was the identical 'Rocket' that ran in the Rainhill trials in 1829. She was completed only just in time for the competition, and never ran a single trip before then. In the evening after the first day's trial, Mr. Stephenson said to my father, 'Now, Stannard, let us have a trip to ourselves;' whereupon he got up, followed by Wakefield, the driver, my father, Mr. Booth, Mr. Moss, and myself. There was not much room, and Mr. Stephenson remarked, 'Put your boy up on the tub, Stannard; he'll be more out of harm's way there;' and there indeed I sat (on the tender) during my first ride on the 'Rocket.' As the butt had been newly painted only the day before, I stuck on very literally while we ran some four miles out and back.

"The enormous funnel made her rather end-heavy, and at last brought her to grief. One evening, going at a good speed, she jumped at a bad joint and tipped up, head downward, in the track, killing an unfortunate visitor, and considerably damaging her funnel and front framing. She was then taken to the shops and fitted with a smoke-box, and a shorter funnel, and after about a fortnight she was sent back to my father again, who worked her up to a very short time before the opening day. I believe no other alteration was made in her till after the 15th of September, 1830. The same water-butt was on her tender on the day as she carried in the previous October, and it was used for a while afterward, but was eventually replaced by a wrought-iron box tank, carried on the same tender. The 'Rocket' worked regularly on the line after it was opened, but was displaced as soon as a sufficient number of heavier engines were provided to deal with the traffic. From facts for which I can vouch from my own knowledge it is clear that the 'Rocket' of 1830 was the same engine as the 'Rocket' of 1829 with an altered funnel; that she worked nearly all the time between her recorded public appearances, and that she did run in the regular service on the Liverpool & Manchester Railway."

Danger in Carrying Corpses.

THE general agent of the Pennsylvania Railroad has written to the Health Officer of Philadelphia, stating that in several instances baggagemasters on their trains have contracted serious sickness by inhaling the fumes arising from dead bodies in coffins or cases, insecurely fastened. In view of this fact and of the expected importation of contagious diseases from abroad during the coming summer, he suggests that the Board of Health consider the question of making it obligatory on the part of physicians and undertakers "that no corpse to which death resulted from a contagious disease of any kind be offered for transportation, and that any other corpse be accompanied not only by a physician's certificate, showing the cause of death, but by one from the Health Department, permitting its removal by train, and that all coffins or cases carrying corpses for transportation by rail be hermetically sealed."

Death of the Oldest Locomotive Engineer in the Country.

JULIUS D. PETSCH, the oldest locomotive engineer in the country, died last month in Charleston, S. C., the city of his birth. He ran the first locomotive ever built in this country and the second ever in use on an American railway. This locomotive was built at the West Point Foundry works in New York in 1830, and was called "The Best Friend of Charleston," having been built for use on the South Carolina railway then in process of construction. It arrived in Charleston on October 23, 1830, and was placed on the road on November 2, 1830. The second engine constructed in this country was built by the West Point works for the same road, which was begun in 1830, and was opened for traffic in 1833, for its whole length, 135 miles. At that time it was the longest continuous line of railway in the world.

Mr. Petsch, as already stated, was the engineer of "The Best Friend of Charleston." He succeeded in inventing a number of improvements to it, which, had they been patented, would have probably yielded him a handsome fortune. The most important of these improvements was the shrinking of wrought iron tires on iron wheels and the placing of what are known as "the outside connec-

tions" on a locomotive. After serving as engineer for some time he was promoted to the office of superintendent of the South Carolina Railway during the presidency of Mr. H. W. Connor.

During the Seminole war Mr. Petsch was employed as an engineer in Florida. As a master machinist, Mr. Petsch was known all over the State. He superintended the building of the "New Bridge" over the Ashley river, the placing of the machinery in the Confederate gunboat *Chicora* during the late war, and the erection of the machinery in the cotton mill at Graniteville, S. C. He was in his seventy-eighth year at the time of his death.

Railways of British Guiana.

THE Demerara Railway extends from Georgetown, the capital of British Guiana, twenty miles into the interior. The description of country penetrated is low, flat and swampy, of such a character in fact as would only be chosen by Dutchmen, the present natives. There are 150 small bridges necessary in the length of this road which cross the numerous canals used for drainage purposes. The surface of the land is below sea level. Branch lines, varying from one-half to about two miles in length, extend from the stations to the estates of the principal farmers for the accommodation of the freight traffic.

The company has 8 locomotives, each having 3 pairs of driving wheels and 2 each having 2 pairs, 14 passenger-cars of various classes and 202 freight and other cars.

During the year 1883 there were 325,663 passengers and 76,774 tons of freight transported.

The earnings for that year amounted to $191,762.78, while the operation for the same period cost only $88,-028.40 leaving the handsome net amount of $103,734.38, after paying the above expenses.

Running Locomotives.

"LOTS of chaps think it would be fun to run an engine," said the driver, as he stuck his head, a flaming torch and a long-necked oil can in under his machine, "but if the most of 'em would try it they wouldn't like it quite so well. 'Taint everybody can run a locomotive either, though I s'pose it's like running a daily newspaper, which I've heard tell everybody can do. Now, a nervous man has no business in a cab; no more has a careless one or a stupid cuss. To run an engine a man must feel his responsibility, and keep his head level. I don't believe half the people know what it is to run an engine. Now, there's the machine; that is the first thing, and it has to be in good order, and stay so. A locomotive has to stand wear and tear and weather that'd knock a stationary engine into smithereens. And no matter what emergency rises—freezing of pipes or starting of flues, a loosening of packing or heating of journals—we've got to know just what to do, and do it right quick, too. Then when we're running there's the time-cards, and pretty often a new one. And the train orders—they are life and death and reputation to us, and to read 'em correct and to live up to 'em gives us no end of anxiety. Bet I've read a train order over a dozen times an hour—I am always so afraid of making a mistake or forgetting. You know the consequence of even a little mistake sometimes. Then, there's the signals to watch, the conductor's gong overhead, steam to keep up, time to make, whistle-posts and crossings to look out for, bad spots in the road to be careful on, and along with all this, there's the track ahead of ye which your eyes mustn't leave for more'n five seconds. There's the brakes, too—one is always worrying about them. I don't s'pose everybody knows, either, that we have to be mighty careful when we come to the top of a grade. You see in going up she labors hard, and so as soon as she begins to descend she makes a rush, and there's the danger of breaking your train when the rear cars are still dragging on the up grade. This danger is especially great on freights, but no good engineer fails to shut off some of his steam when his engine reaches the summit. It isn't every fool that can run a locomotive."

Steel Rail Production.

THE productive capacity of the steel rail mills of the United States is about 1,600,000 tons per annum. About 600,000 tons went into new lines last year, and the amount used on renewals, new second track, and siding, is estimated as 650,000 tons, or 5.42 per cent. of the total amount of rails in track. This rate is equivalent to a renewal of the lines once in 18.4 years. At the end of 1883 a little more than half the track of the United States was iron. The consumption of rails for maintenance ran down from 10.30 per cent. in 1872, when steel rails were first used, to 5.92 per cent. in 1877; then rose again to 11.16 per cent. in 1881, and receded again to 5.42 per cent. in 1883.

The Oldest Passenger-Car.

PROBABLY the oldest passenger-car now in use in this country is on the Tioga Railroad. It is called the "Morris Run," and was built in Wilmington, Del., in 1840. The original cost was $2,000, which was considered a large sum in those days.

IT is now proposed to make a tunnel and railway through the Splugen. The project is regarded with great favor by those interested in Lombardian railways, and support is looked for from Bavaria, Wurtemberg and other parts of Germany. The estimated cost of the whole work is about $16,200,000.

THE report of the Mexican railway company for the half-year ended June 30th shows: Gross earnings on the main line, $2,020,650 against, $3,082,100 in 1883; and net earnings, $1,242,115, against $1,699,170 in 1883. The net earnings of the Jalapa line were $13,560, against $20,385.

THE first railway guide-book was called "Gadsby's Monthly Railway Guide," and it appeared i 1839, its price being three-pence. Out of it grew "Bradshaw's," the great European guide-book, which was first issued in 1842.

THE Pullman shops at Pullman, Ill., are to build 50 passenger cars for the Staten Island Rapid Transit Co., to be delivered by May 1 next. They are to be light cars, similar to those in use on the elevated railroads in New York.

THE surveys of the proposed railway from Tapachula to San Benito, Chiapas, are now completed. The length will be 18 kilometers.

Street-Railways.

American Street-Railway Association.

President.—Calvin A. Richards, President Metropolitan Railroad Company, Boston, Mass.

First Vice-President.—Julius S. Walsh, President Citizens' Railway Company, St. Louis, Mo.

Second Vice-President.—Henry M. Watson, President Buffalo Street Railroad Company, Buffalo, N. Y.

Third Vice-President.—Edward Lusher, Secretary and Treasurer Montreal City Passenger Railway Co., Montreal, Canada.

Secretary and Treasurer.—William J. Richardson, Secretary Atlantic Avenue Railroad Company, Brooklyn, N. Y.

Office of the Association, cor. Atlantic and Third Avenues, Brooklyn, N.Y.

The Fourth Annual Convention of the Association will meet in St. Louis, Mo., on October 21st, 1885.

THE MAGNITUDE OF FUTURE STREET-RAILWAY OPERATIONS IN NEW YORK.

WE publish elsewhere in this department an interesting series of tables prepared by the New York Arcade Railway Company for general distribution, showing conclusively that the operation of street-railways in this city is on the marked increase. As in New York so is it fair to conclude is it in other cities, and the deductions drawn from these statistics are fully borne out by the premises.

In the year 1850 there were but two street-railways in this city, carrying 6,835,548 passengers annually. In the year 1884 twenty-three street-railways carry annually 284,115,862 passengers; thus while in round numbers there are now twelve times the number of roads that were operated in 1850, there is over forty times the passenger traffic, the traffic increasing nearly four times as much in proportion as the facilities of travel. In the same space of time the population of the city has increased from half a million to a million and a quarter, an increase of one hundred and fifty per cent., and the surprising conclusion is reached that the passenger traffic of the roads of New York has increased twenty times as much in proportion as the population of the city.

Adding to the total number of passengers carried in 1884, the passengers carried by the three omnibus lines, which may be classed in the same category as street-railways, amounting to 18,067,500, we are furnished with a grand total of 302,183,362 passengers, which at an average fare of five cents yields a total of $15,109,168.10 as revenue to the street-railways of this city during the past year. It is true that these figures include the traffic and revenue of the elevated roads, but the four lines of the latter carried less than one-third the total number of passengers, and the five leading surface roads, the Third Avenue, Second Avenue, Dry Dock and East Broadway, Sixth Avenue, and Broadway and Seventh Avenue roads carried an excess of over seven million passengers as compared with the total passenger traffic of the four elevated lines, thus disproving the assertion that the introduction of the elevated roads has marked the decline of the surface roads. It is further demonstrated that the natural growth of passenger traffic in this city during the past seven years, or since the construction of the elevated roads, is over twenty-three millions in excess of the total annual traffic of the elevated roads. It is also true that the leading surface road, the Third Avenue, carried in the past year over thirty-one million passengers, or about one-third the total traffic of the four elevated lines, thus proving that the surface roads, despite the disadvantages under which they labor, still control their full share of traffic.

The mere mention of these collated facts is interesting, but the inevitable deductions to be drawn therefrom are highly instructive and warn us of the needs and requirements of the future. Tabulating the increase of population of New York City, the increase of its traveling facilities, and the increase of passenger traffic since 1850, we are furnished with an index of our future requirements. This tabulation may be expressed as follows, the unit being an increase of one hundred per cent.:

Increase of population	1½
Increase of railway lines	10½
Increase of passenger traffic	40½

Upon this basis it is easy to comprehend that the increase of passenger traffic far outstrips the increase of facilities and to a much greater extent the increase of population, and assuming the present ratio of increase of population to continue for the ensuing sixteen years, in 1900 there will be a total passenger traffic of several billions.

But the tabulated statistics which we publish assume a fairer basis of computation in omitting the figures of the early days of street-railways, reckoning only upon the experience of the past twenty years, and upon this basis, which is a most moderate one, we are given a total traffic in 1900, of one billion and a quarter of passengers. A still more moderate estimate is made by reckoning from the experience of the semi-decade 1875-1880, a period of remarkable business depression, but even with these figures we are furnished with a total annual traffic sixteen years hence of nearly eight hundred and fifty million passengers, and in the full knowledge that at present the street-railways of the city, including the elevated roads, are taxed nearly to their utmost capacity, it is evident that provision will have to be made during the next sixteen years for at least five hundred and sixty million additional passengers, and during the next six years for nearly one hundred and forty million. In the face of these figures it is evident that the street-railway interests of this city as well as of the entire country are rising to great prominence, and attracting the attention of capitalists. The increase of roads, of rolling stock, and of invested wealth are great stimulants to an improvement of service in every respect,

and problems of street-railway construction and management are daily assuming greater proportions. Without attempting to prescribe the ways and means for overcoming the difficulties, it can also be said that other methods of traction than horse-power must ultimately be employed, both on the grounds of economy and speed, and it is not going too far to say that other avenues of travel than the surface of our streets must also be selected for the construction of roads. The solution of these problems will be the work of years, but eventually it will be reached, and so thoroughly has public interest been awakened to the magnitude of street-railway operation and of the interests involved, that the columns of our daily press are replete with discussions as to the construction of new roads and the introduction of new methods of operation and management. The year past has witnessed a strong revival of street-railway enterprise in this city which had lain dormant since the elevated roads went into operation, but we will be surprised if the present year does not see this revival widespread, and attracting universal attention.

ARGUMENT still continues upon the advisability of constructing a surface road upon Broadway. The scheme has warm friends and bitter enemies, neither of whom it is reasonable to suppose are wholly disinterested, but so thoroughly has the project attracted public attention, that it is highly improbable that jobbery will be permitted in furtherance of any interests involved, and if the road is constructed the consolation will be afforded that the franchise has been honestly awarded at a fair valuation.

CENTER-BEARING VERSUS SIDE-BEARING RAILS.

BY A. J. MOXHAM.

[Written for the AMERICAN RAILROAD JOURNAL.]

IN discussing the relative merits of the two forms of street-railway rails, the subject will be considered from a purely rail standpoint. That aspect of the question which involves the effect of the rail upon passing street vehicles is one that permits of good arguments for either form. Both must be non-obstructive to street traffic. This granted, it is questionable whether anything more is due, and if not, such question as might arise would be purely local, and one that would be settled by policy rather than rail merit.

The first and principal objection urged against the side-bearing and in favor of the center-bearing rail, is the easier traction on the latter. The close proximity of the head of the side-bearing rail to the street surface tends to keep it constantly dirty, and adds materially to difficulty of traction, and to an equal extent to the discomfort of the passengers. Of this there can be no question; it must be and is accepted as inevitable. A second objection urged against the side-bearing rail is that the constant passage of the weight of the car on the one side tends to tilt the rail. It is thought that this is exaggerated; the rail can only tilt by compression and yielding of the stringer on the edge most compressed. Were street-cars the only vehicles passing over the rail it might be a consequence; but it is a fact that whereas the car weight tends to this compression, all the other vehicles using the tram tend to reverse or equalize this outer compression. This objection is most strongly urged in the larger cities, and yet it is a fact that in these cities the street traffic far exceeds the car traffic, both in weight and number. As an example: On one of the main streets in Philadelphia, the wagons passing on the track were counted for twenty-five minutes; they numbered 103. The passing street-cars were not counted, but at a one-and-a-half minute headway they could not have exceeded eighteen. If the tendency of the rail to tilt be due to a difference of compression in the various parts of the stringer, certainly there is nothing here to indicate that the difference exists on the head side. It is questionable whether, if the center-bearing rail were subject to precisely the same conditions of use, it would show any advantage over the side-bearing in this respect. The problem would be merely reversed, the car weight being sustained by the center, and that of street vehicles by the side or edge of the stringer.

It has been urged by some that the form of the center-bearing rail does not invite street traffic to the same extent as that of the side-bearing. Doubtless this is true *cæteris paribus*, but if it is remembered that whether the rail invite street traffic or not, it at least must not interfere with it to any unreasonable extent, and further, that in a crowded thoroughfare the street traffic *has got to use the rail* whether invited or not, there does not remain any great scope for such argument. It is, however, a fact that few street-railway men realize this. If the center-bearing rails in New York be carefully examined it will be found that by far the greatest wear to the rail has occurred to the side trams; and it will be further found when the rails have lived their day, that a comparatively small proportion of the head has been utilized. An interesting test was made of this point by the writer. The percentage of wagons using the tracks were counted, first on the side-bearing rail in Philadelphia; secondly, on the center-bearing rail in New York. The locality chosen in Philadelphia was Market street, between 8th and 9th streets; of 129 vehicles, 106 were using the track, or 82.17 per cent. The locality chosen in New York was Chatham street near Pearl street, and Canal near West Broadway; of 174 vehicles, 128 were using the track, or 73.87 per cent. There was thus a difference of but about nine per cent. in favor of the center-bearing rail.

It is, however, doubtless true that in a medium-sized town of only average amount of street traffic, and with wide streets, the center-bearing rail is less used by the street vehicles than the side-bearing. But it is thought that this advantage decreases in proportion to the extent to which any thoroughfare is crowded, and that in very crowded streets it becomes *nil*. For these reasons it is thought that the tendency to tilt is not due to the side-bearing head.

It can, however, be attributed to a cause induced by the fact that the *tram* (not the head) is side-bearing. That cause is curvature of the rails induced by street traffic. A dozen points can be selected in Philadelphia where, taking position in the center of the track and looking in

perspective along say a quarter or third of a mile, every rail will be seen to have assumed the form of a parabolic curve; the curvature being so clearly defined at every joint that these joints can be counted by it for a considerable distance. To one not accustomed to mechanical operations, it is hard to realize that a heavy rail can be changed in form by loads passing over it, any one of which is not sufficient in itself to apparently even disturb the rail; such is nevertheless the fact. It is like the mechanic's six-ounce tymping hammer, the problem of a very small force infinitely applied.

I have in my own experience changed the form of a casting weighing about 6,000 lbs., by a tymping hammer. It was a squeezer scroll, slightly out of true spiral; it was suspended so that its weight aided the change of form desired, and though eighteen inches deep by four inches thick, it yielded to treatment in two days' work.

This curvature throwing the head over the stringer, the rail tilts. This action in the side-bearing rail is aided by the exposed condition of the spikes; they become so loose that they fail to contribute their proper share in the holding of the rail.

The center-bearing rail seems entirely free from this defect. It is true the trams are also subject to the elongating strain of street traffic, but this occurs on both sides of the head. It is only any difference that may exist in the local strain induced in either tram that tends to curvature in such a case, and this is so slight that the head is amply able to resist the change of form thus invited. Again, the flanges being narrower, the leverage with which this net difference acts is materially reduced, and as another factor, is the better hold of the spikes. In a side-bearing rail, a wheel passes over every spike in the rail it is using; in the center-bearing it only passes over half the number.

For the two important reasons given, viz.: "greater cleanliness of head and consequently easier traction, and capability of retaining its true alignment, there can be no question that the center-bearing is the better rail of the two.

The center-bearing section as now designed, seems capable of some improvement. Its use has led to conclusions that are largely followed, which it is thought in some instances are fallacious; one is, that great height of head is advantageous. It is argued that it contributes largely to greater cleanliness. Is this so?

It must be remembered that even a small increase in the height of head means a very great increase in the obstructiveness of the rail to passing vehicles. The question of one-fourth of an inch difference in this respect has been known, in my experience, to have gotten the railway company into considerable trouble both with the owners of vehicles and the municipal authorities. It goes without saying that, if it were permissible to increase the height of head to say six inches, such head *would* be cleaner. It is not, however, a question of inches, but of fractions of an inch, and it is believed that the small addition permissible adds so much more to the obstructiveness of the rail than it does to its cleanliness, that the tendency is to push it too far. In Louisville a center-bearing rail is in use with a head about one inch high. In New York and Brooklyn, one with a head from 1¼ inches to 1⅜ inches high, measuring in both cases from the bottom of the groove in the tram. Both rails are five inches wide. I have carefully watched the use of both, and have tried to institute a comparison as to their cleanliness and easy riding in as nearly the same conditions of street surface as possible, taking a pasty, sloppy condition in both cases. I have been unable to ascertain any noticeable difference in favor of the higher head.

The effect of ¼ or ⅜ inch increase in the height of head is in proportion to its relation to the varying height of accumulation on the street surface. Were that variation never over ¼ inch it would be a large factor; but when, as is the case, it amounts to several inches, it ceases to be so.

The benefit of the increased weight and consequent stability of the New York or Brooklyn rail should not be placed to the credit of this particular point, as it often is, in the general assertion that it is a better rail. I believe it possible to show that any increase of weight can be more advantageously bestowed elsewhere. It is believed that a short analysis will show that the real factor of cleanliness is the use of the two side trams.

Every vehicle using these trams plows its way through any accumulation that may have encroached upon the rail, throwing it out and into the street. The tendency of the same is of course to return, it being remembered that the level of the now comparatively clean tram is below that of the neighboring accumulation. Were the dirt as liquid as water, its return would be simultaneous with the passage of the wheel. Being generally less plastic, it takes longer.

The time it takes to reach the rail again is governed by the distance it has to travel, (viz.: the width of the wheel that has passed, and its speed of flow.) If it takes say a half minute to return, and wagons pass at smaller intervals, the rail is kept continually more or less clean.

The passing wagons are thus effectual in keeping the head clean by the use of the side trams, and the design of the rail should be such as not to let its height of head reach that limit of obstructiveness which will interfere with the tendency of a sufficient number of wagons to use the track to certainly effect this purpose. The width of side trams is no factor in the problem, it being of course assumed that they are sufficiently wide to permit of use. The cleansing process is effected by the wagon wheels.

Another point that seems worthy of some thought is the practice of grooving the side trams. It is claimed that it protects the spike-heads; so it does, as long as the tram retains its projection. An examination of the rail, where it has been in use for even a short time, will show that this point is that of most rapid wear in the rail. It increases in speed of wear in proportion to the extent of the groove, for this groove merely means that the rail offers just that much less metal to take up the wear from street vehicles.

It is hence a fact that the more the spikes are protected (?) the quicker the street traffic gets at them. The spikes could be just as thoroughly protected by rolling countersinks in a solid tram, and the greater amount of metal thus introduced would effect two purposes: First, retain the weight and consequent stability of the rail at the desired point (having as indicated partly reduced this by taking off part of the head), and secondly, induce a greater life in the side trams.

In this discussion I have instituted a comparison between the two shapes under, as nearly as possible, the same

conditions of usage, and I have put the standard of usage at the maximum, that in the crowded thoroughfare of a large city. The wear of the different parts of the rails would, of course, vary under other circumstances. The object has been purely a comparison.

It is a fact not often fully considered that the proportions of the different parts of a rail should really vary, as the general extent of street traffic at any given point varies, in proportion to the traffic of the street-cars.

THE PAST, PRESENT AND FUTURE OF PASSENGER TRAFFIC IN NEW YORK CITY.

THE following table of official figures issued by the New York Arcade Railway Co., exhibits the lines of street-railway and passenger-traffic of New York City, from the year 1853 to 1884, as related to growth of population:

Population.	Railways.		Passenger Traffic.
1850 515,547	2	1853	6,835,548
		1854	6,817,197
1855 629,810	4	1855	18,488,459
		1856	23,153,050
		1857	22,190,431
		1858	27,900,388
		1859	32,888,794
1860 813,669	6	1860	36,455,242
		1861	26,274,360
		1862	35,878,044
		1863	40,412,357
		1864	60,900,200
1865 726,386	12	1865	82,054,516
		1866	88,953,016
		1867	100,541,562
		1868	105,816,695
		1869	114,349,123
1870 942,292	12	1870	115,139,553
		1871	133,893,981
		1872	143,696,989
		1873	145,358,805
		1874	151,927,233
1875 1,045,223	19	1875	166,918,173
		1876	168,413,971
		1877	163,936,298
		1878	170,189,502
		1879	187,983,792
1880 1,206,299	23	1880	211,222,348
		1881	231,386,771
		1882	252,871,646
1883	23	1883	268,749,877
1884	23	1884	284,115,862

OFFICIAL FIGURES OF PASSENGER TRAFFIC FOR 1884.

Broadway and Seventh Avenue	17,771,110
Central Cross Town	3,540,583
Central Park, North and East Rivers	15,849,985
Christopher and Tenth Streets	4,492,771
Dry Dock, East Broadway and Battery	18,141,414
Eighth Avenue	14,466,240
Forty-second and Grand Street Ferry	8,544,012
Harlem Bridge, Morrisania and Fordham	2,908,244
Houston, West Street and Pavonia Ferry	4,387,699
New York and Harlem	15,038,579
Ninth Avenue	3,380,315
Second Avenue	19,397,072
Sixth Avenue	17,273,570
South Ferry	546,851
Third Avenue	31,395,490
Twenty-third Street	10,279,303
Manhattan Elevated	96,702,620
	284,115,862
Adding three omnibus lines, which carry	18,067,500
Produces a total passenger traffic for 1884	302,183,362

INCREASE OF PASSENGER TRAFFIC FOR SEVEN YEARS:

No. passengers, exclusive of omnibuses, 1884	284,115,862
No. passengers, exclusive of omnibuses, 1877	163,936,298
Increase in 7 years	120,179,564

The above figures show that the natural growth of passenger travel for the seven years, exceeds the total traffic of all the elevated roads by 23,476,944.

It will be seen by the above table that in the year 1884 the Third Avenue horse-railroad carried over 31,000,000 persons, and that five leading horse-car lines carried, in excess of all the elevated roads, 7,275,934.

INCREASE OF TRAFFIC, GROWTH OF POPULATION, AND ESTIMATES FOR FUTURE TRAFFIC.

The increase of population during the present century has averaged $46\frac{7}{10}$ per cent. per decade, and passenger traffic during 20 years past, has increased $141\frac{4}{10}$ per cent. per decade, or as $3\frac{29}{1000}$ for passenger traffic, to 1, for population; upon this basis the traffic in 1890 would be 509,045,858; and in 1900, 1,226,800,517.

Selecting as a basis of calculation, the semi-decade from 1875 to 1880 (remarkable for great financial depression), showing the lowest percentage of increase of travel, viz.: as 15 of population to 27 of traffic, or approximately, 2 of traffic to 1 of population, the passenger traffic in 1890 would be 422,444,696; and in 1900, 844,889,392.

It will be seen that, at the lowest estimate, provision will have to be made for an increase of traffic within six years, or in 1890, of 138,328,834; and 16 years hence, or in 1900, of 560,973,530.

ADDITIONAL ACCOMMODATIONS INVARIABLY PRODUCE GREATLY INCREASED RATIO OF TRAVEL.

The following table shows the number of railways in operation and average number of passengers carried yearly by each, and demonstrates that increase of travel is stimulated and in a large degree governed by the additional accommodations furnished:

In 1855	4	railways carried each	4,622,114	18,488,459
In 1860	6	" "	6,075,873	36,455,242
In 1865	12	" "	6,837,876	82,054,516
In 1875	19	" "	8,785,167	166,918,173
In 1884	23	" "	12,352,863	284,115,862

At no time in the history of passenger traffic of the city have the accommodations been sufficient, and invariably the construction of additional railways has been followed by a remarkable increase in passenger travel. The need for additional transit facilities was never before as urgent as now, and, with a continuous yearly increase of more than twenty million constantly swelling the demand, it is evident that additional provisions to meet this necessity must immediately be made.

Experiments with Electric Locomotion.

IN a few weeks it is expected that preparations will have been completed by the elevated roads of New York for a test of electric locomotion on the Second Avenue line. A central line will be laid between the rails from Chatham Square to the Harlem River terminus, to which electricity will be conducted from dynamos. This rail will be insulated, the present tracks remaining as they are. The expense of building the third rail will be divided among the electric railway companies, all of which will be allowed equal facilities for experiments with the motors. A commission is to be selected by the companies to decide on the relative merits of the inventions, and after their decision a company will be formed to control all the patents for the several companies for this country, and for these rights each company will receive stock in the new company in proportion to the value of the property and patent rights conveyed by it. It is claimed that the regulation of the speed of trains will be less difficult with electricity than with steam, and that the trains can be stopped more quickly and be at all times under more perfect control. The noise will be less, and the smoke and cinders will be avoided altogether.

Extent of the Cable Road System.

ANDREW S. HALLIDAY, of San Francisco, who invented the system of cable railways in 1869, was recently asked by a New York *Tribune* reporter if he had experienced much difficulty in introducing his system. He smiled and said: "I think I had. I invented my system in 1869, but the first cable street-railway was not built and ready for use until September, 1873. The first bit of road was built in Clay street, San Francisco, which was 49 feet from house to house and was full of gas and water mains. People laughed at me and were afraid to invest in the scheme. Three friends, Joseph Britton, Henry L. Davis and James Moffitt, helped me in the undertaking. The grade of the street was one in five, pretty steep, and the line was 2,800 feet long. The road soon became a success. It made money and carried passengers at a low rate. It was cleaner than a horse-railway. There were less delays upon it, and it was able to carry as many people as an almost continuous line of cars would carry.

"Soon afterward a horse-railway company converted their line into a cable-road, and the shares of the company advanced in a short time from $22 to $102. A year later a cable road was built through California street. To-day there are thirty miles of single track cable roads in that city. More than half of this length of road has been converted from horse-railways. There are over twenty miles of cable road in Chicago, and they worked last Winter without losing a day, even with the ground frozen to a depth of two and a half feet. The streets are kept clean with far less trouble with a cable road than a horse-railway. A 500 horse-power engine can certainly do more work than ten horses hitched to a street cleaner. Dunedin, New Zealand, a city of 30,000 inhabitants, has two cable roads. A company in Melbourne has just obtained a franchise for sixty miles and will put stock to the amount of £1,500,000 on the market. Sydney, New South Wales, has adopted the system. The premier of New South Wales visited San Francisco eighteen months ago to inspect it. Edinburgh, Scotland, has decided to adopt the system, and Birmingham and Manchester, England, are considering the advisability of following suit. Roads will shortly be built in Pachuca and Guanajuato, Mexico.

"Seven millions of dollars have been spent in San Francisco in the construction of cable roads, and that sum is paying large interest. A well equipped road will cost from $75,000 to $200,000 a mile. This includes power and equipment. I have a short road in London, England, which I built after a hard fight with the various carrying companies. It possesses the stone on which Whittington sat with his cat, when he heard the bells telling him to turn back. I believe that passengers could be carried over the East river bridge for two cents, and that this rate would pay the carrier. Any number up to 30,000 could be carried per hour."

STREET-RAILWAY NOTES.

THE presidents of street-railway lines in Philadelphia have been elected as follows: Empire, James McManes; Union, William H. Kemble; vice-president, P. A. B. Widener; Continental, W. L. Elkins; Seventeenth & Nineteenth, M. S. Quay; Ridge Avenue, E. B. Edwards, vice-president, John Lambert; Second & Third, Alexander M. Fox; Frankford & Southwark, Henry Geiger; Chestnut & Walnut, William W. Colket; Tenth & Eleventh, John McCarthy; Hestonville, Mantua & Fairmount, Chas. H. Lafferty.

THE city solicitor of Philadelphia has given an opinion that the charter of the Philadelphia and Northern Railroad Company, which is to construct an elevated railroad in that city, is in regular form, but the company will be liable for all real and consequential damages arising from the construction of the road.

THE Union Depot Street-Railway & Transfer Company of Stillwater, Minn., has gone into the hands of a receiver. The liabilities are stated to be but fifty per cent. of the assets and the company is soon expected to resume business.

THE city council of Kansas City, Mo., have passed an ordinance for the construction of an elevated railway between Kansas City and Wyandotte, and the work of construction will soon be commenced.

THE Manchester (Va.) Railway & Land Improvement Company recently organized for the purpose of building a street-railway, invite proposals for furnishing the necessary cars and rails.

IN the department of New Inventions of this issue of the JOURNAL, are published illustrated descriptions of a horse-car canopy and of a street-railway rail.

TWO new lines of street-railway have recently been opened in Durango, Mexico.

WANTED.

A Situation with some Street-Railway Co.,

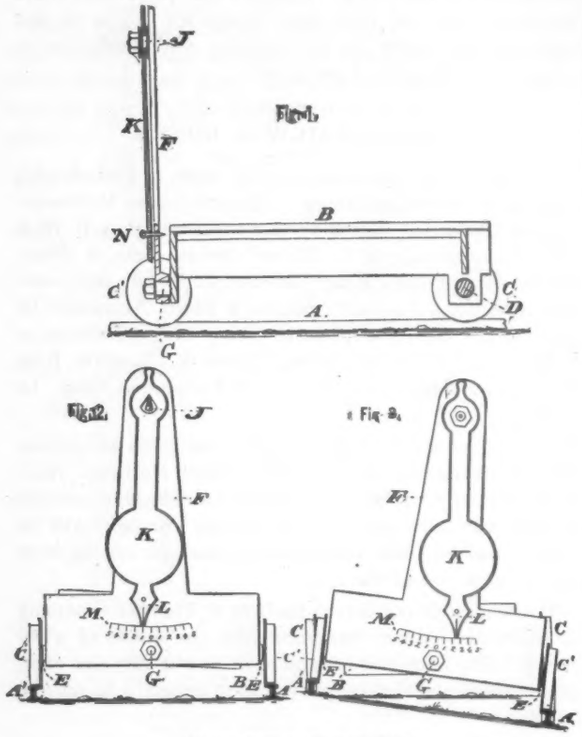
by a gentlemen who has been brought up in the business and has had experience in its every department. Is road superintendent of 25 miles of street-railway, and desires to make a change March 1st. Satisfactory reasons given for leaving present position and best of reference given, including present employers. Address,

"SUPERINTENDENT,"
Care of American R. R. Journal.

New Inventions.

McGregor's Railway-Gage.

GEORGE MCGREGOR, of Cincinnati, O., is the inventor and patentee of a railway-gage, the object of the invention being to provide a means for verifying the proper relative elevation of the two rails composing a railway-track or their degree of departure from such relative elevation, it being understood that on a straight stretch the component rails should show precise agreement of level,



MC GREGOR RAILWAY-GAGE.

while on curves their relative height should have a certain predetermined difference, depending on the sharpness of the curve and the maximum speed of running.

The invention consists in hanging a plumb-bob or pendulum on a standard, which is so pivoted to the car-body as to be capable of free oscillation transversely of the track, the standard having attached to it the axle of the front wheels, and the pendulum being capable of hanging vertically, notwithstanding oscillations of the standard, and indicating upon a graduated scale inscribed upon the standard whether at that precise plane the two rails are at the same level or to what extent out of level. For this purpose the graduations on the scale are made to indicate the exact relative elevations of the two rails in parts of inches or of centimeters, or any other accepted basis of measurement, by the pendulum falling over to that side which is, for the time being, more depressed than the other.

In the accompanying cuts, Fig. 1 is a fore-and-aft vertical section of a railway-car embodying the invention, and Figs. 2 and 3 are front elevations of such a car at two different parts of an uneven track. The reference-lettering is similar throughout the cuts.

A A′ represent portions of the component rails of a railway-track. B represents the body or platform of a hand-car, whose rear wheels C, are keyed fast to the customary shaft D. This shaft or axle, where the car is adapted for propulsion by persons riding upon it, is connected by any suitable transmitting mechanism, with customary hand-levers. In the form selected for the present illustration the front wheels C′, revolve freely on the front axle E, which is a true axle—that is to say, it does not itself revolve, being firmly attached to a standard F that is coupled to the car-body or platform B, by a pivot G, situated midway between and parallel to the rails. This construction enables vertical oscillation (about the pivot G) of the standard and of its attached axle relatively to both the pendulum and to the car-body and the rear axle.

From the upper part of the standard F projects a fulcrum J, in form of an inverted V, upon which is hung a pendulum or plumb-bob K, which terminates below in a pointer L, whose position relatively to a scale M, inscribed upon the standard, indicates the precise relative height of the two rails at that particular spot. Unnecessary wear of the pendulum when not in use may be prevented by the insertion of a pin N (Fig. 1), through suitable orifices in both pendulum and standard.

The above-described form of the invention may be varied in non-essential particulars. For example, the standard may be provided with such scale and corresponding pendulum on its rear, either instead of or in addition to its front side, as here shown. The front axle may, like the rear axle, be keyed fast to the wheels and revolve in journal-bearings, which bearings in that case are (instead of the axle itself) pivoted to the oscillating standard.

The inventor has assigned the patent rights to his son, George W. McGregor, of the same place.

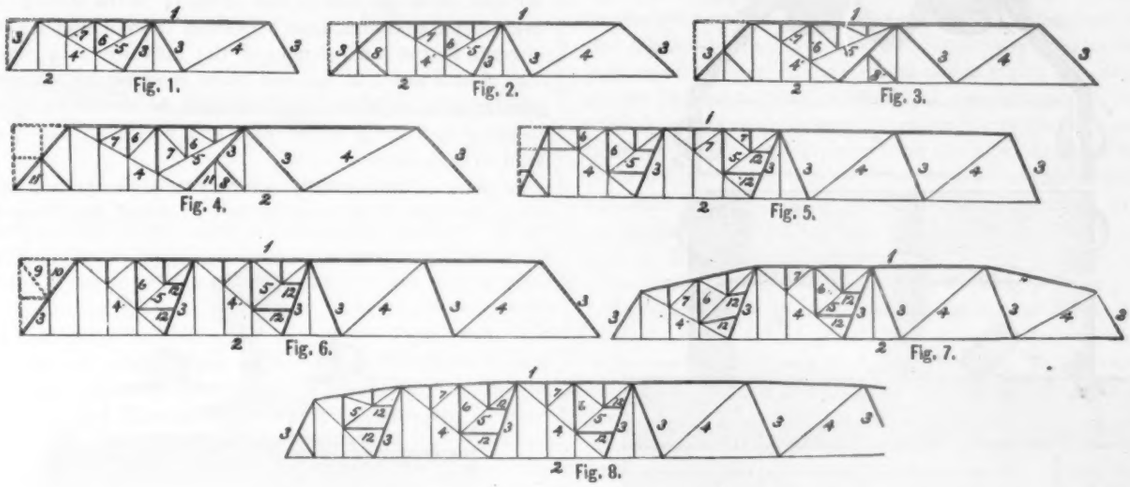
Thacher's Improved Bridge-Truss.

EDWIN THACHER, of Pittsburgh, Pa., has recently invented an improvement in the construction of bridge-trusses, the object being to provide a bridge-truss which shall be economical in material and inexpensive in workmanship, and which shall be exempt from temperature strains in its members, and from ambiguity in strains, and which shall not involve in its construction the use of counter-ties or adjustments of any description.

As shown in the accompanying diagrams the invention consists in the combination of a primary single-system triangular truss and secondary trussing forming a series of secondary triangles within those of the primary truss. Figs. 1 to 8 are diagrammatic side views, in elevation, of bridge-trusses embodying the invention, the figures of reference being similar throughout.

A primary truss is provided, which is formed of a top chord 1, a bottom chord 2, and a web of inclined struts 3, and ties 4, connected at their opposite ends to the top and bottom chords respectively, and forming therewith a series of triangles which are free to change their figure under the influence of temperature changes. Each of the center ties 4, extends over not less than three panel-lengths of the truss, and each of the struts 3, over not more than two panel-lengths. The secondary trussing, which, in connection with the primary truss, supports the

loads at panel points intermediate between the apices of the triangles of the primary truss, and transmits the strain of the loads to said points, is of the following construction: Secondary ties 5, lead from the top chord 1, at the apices of the triangles of the primary truss to the primary ties 4, which form the bases of the triangles at an intermediate point in the length of the ties, the secondary ties 5 forming, with the top chords 1, and primary ties 4, triangles, which are subdivided by a secondary trussing of posts 6 and ties 7, connected at panel-lengths into a series of smaller or secondary triangles, each having, as shown, a length of one panel. For points subtended by the primary struts, a strut 8, leading from the bottom chord 2, or a tie 9, leading from the top chord 1, is connected with the primary strut at an intermediate point, from which the load above or below is supported directly by posts 10, or suspenders 11, as the case may be. The primary struts 3, may be supported by horizontal or inclined struts 12, leading from points in the secondary ties 5, as shown in Figs. 5 to 8, or by other means.



THACHER'S IMPROVED BRIDGE-TRUSS.

In the several figures the primary trusses only are shown on the right, and both the primary trusses and the secondary trussing are shown on the left. The top chords 1, may either be straight, as in Figs. 1 to 6, inclusive, or broken, as in Figs. 7 and 8, and for deck-bridges the top chord may be extended as shown in dotted lines on the left of the figures.

It is claimed by the inventor that bridge-trusses constructed in accordance with his invention will be found to present the following advantages: They are free from the temperature-strains, which are exerted to a greater or less extent in counterbraced or quadrangular trusses, and which are due to the unequal size or exposure of the various members, or to a difference in the character of the materials employed.

The improved truss contains no confined quadrangles, and each triangle of which it is composed can freely change its figure under the action of temperature. Trusses composed of two or more complete systems of bracing of the ordinary construction are subject to ambiguity in strains—that is to say, the strains in the members are such as not to admit of exact calculation. This is particularly the case where the chords are curved or broken, and to some extent with straight chords.

In the improved truss the strain on each and every member can be accurately calculated. The weight at any intermediate panel point can be conveyed to the joints of the primary truss in a single route, and as the primary truss consists of a single system of triangular figures, the weight of every joint is borne to the masonry or supports by one route only, and consequently no ambiguity in strains can exist. The absence of counter ties or adjustments reduces the expense of manufacture, and obviates the overstraining to which counter-ties are subjected by unskilled or careless workmen. The construction is likewise economical in material proportionate to its capacity for supporting loads, and involves no expensive workmanship.

Gottlieb's Metallic Railway Cross-Tie.

ABRAHAM GOTTLIEB, of Pittsburgh, Pa., is the inventor and patentee of a metallic railway cross-tie which is herewith illustrated and described. The object of the invention is to provide a metal cross-tie and also devices for properly securing and leveling the rails on the ties, which is accomplished by shaping the tie so that it may be easily rolled or otherwise formed, and can be securely embedded in the ballasting, and also by constructing the fastening devices so that rails may be adjustably secured to the ties, thereby providing for tracks of varying gage and for variations of gage in the same track or line of road, and any irregularity in the alignment of the ties themselves.

In the accompanying cuts, Fig. 1 is a transverse sectional view of the cross-tie, the rail and locking-plates being shown in elevation. Fig. 2 is a top plan view of one end of the cross-tie, the rail being shown in section. Fig. 3 is a side elevation of the cross-tie, the rail being shown in section and received by a modified form of locking-plate. Fig. 4 is a plan view of the cross-tie. Figs. 5, 6, 7, and 8 are

plan and edge views of the forms of locking-plates employed at curves in line of rails. Fig. 9 is a transverse sectional view of a modified form of the locking-plate shown in Figs. 5 to 8. Fig. 10 is a side elevation of the same. The figures of reference are similar throughout.

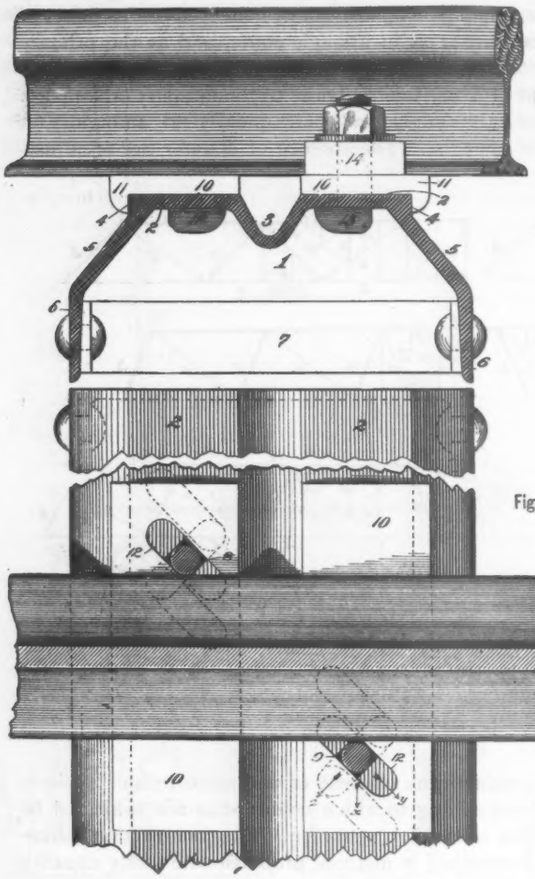


Fig. 1.

Fig. 2.

GOTTLIEB'S METALLIC RAILWAY CROSS-TIE.

The cross-tie 1, is formed with two beds 2, running parallel with each other longitudinal to the tie, and between these beds is formed the longitudinal groove or corrugation 3, thereby increasing the resistance of the cross-tie as against flexure, such increased resistance being especially important when the tie is not uniformly supported on its underside by the ballasting; and this corrugation allows of a slight yielding motion to the supporting-beds 2, thereby providing an elastic support for the rail. Along the outer edge of the supporting-beds 2, are formed the vertical ledges or walls 4, and from these vertical ledges extend the outwardly-inclined sides 5, the outer portions of which are bent inwardly to form the vertical wall 6.

The cross-ties constructed as above described can be formed from steel or iron blooms or billots in any desired length, by passing such blooms or billots through between suitably-grooved rolls and then cutting such rolled blanks into any desired lengths. The vertical walls 6, of the cross-tie are braced as against any spreading action by the transverse braces 7, secured by rivets or bolts to the vertical walls 6, at the ends and middle portion thereof. The number and distances apart of the braces may be varied at pleasure, though to get the best results one should be used at or near each end of each cross-tie and one at or near the middle. In addition to bracing the walls as above described, these braces 7 prevent longitudinal movement of the cross-tie, the ballasting being packed in and around the same.

In the supporting-beds 2, are formed the slots 8 and 9. The slots 9 in one of the beds, are arranged at an angle of forty-five degrees, more or less, to the central axis of the tie, and are located so that at least a portion thereof will not be covered by the outer flanges of the rails when in place. The slots 8, in the other bed have the same angular relation to the central axis of the tie as the slots 9, but are located so that at least a portion thereof will not be covered by the inner flanges of the rails when in place. The slots 8 and 9, at one end of the cross-tie are arranged parallel to each other, but are at an angle of ninety degrees to the slots 8 and 9, at the other end, which are also parallel to each other.

In place of having both outer slots, 9, in one bed, and the inner slots 8, in the other bed, each bed may have an

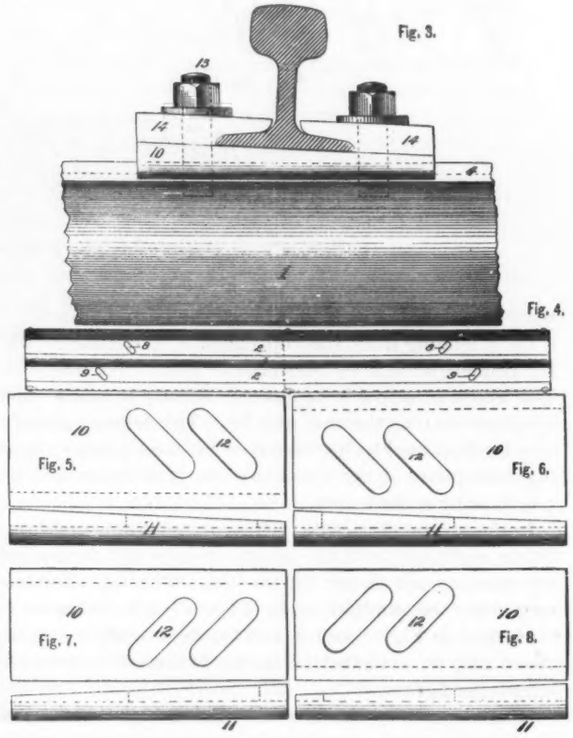


Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.

GOTTLIEB'S METALLIC RAILWAY CROSS-TIE.

inner and outer slot, provided that their angular arrangement with relation to each other as above described is preserved. On these beds at each end of the tie are placed the locking-plates 10, these plates being provided with a flange 11, adapted when the plates are in place to bear against the vertical ledge 4, along the outer edge of the supporting-bed. These locking-plates are provided with one or more angularly-arranged slots 12, which when the locking-plates are in place will form an angle of ninety

degrees with the slots 8 and 9, in the supporting-beds, as shown in Fig. 2. These locking-plates are placed on the supporting-beds with their flanges bearing against the vertical ledges and with their slots 12, directly over the slots 8 and 9, in the beds. Through these slots are passed the bolts 13, having a head projecting on one side only, and having a squared portion immediately above the heads, the remainder of the bolt being round, as usual, and threaded at its upper end. After the bolts have been passed down through the slots until the squared portion is below the slots in the supporting-beds, the bolts are turned around ninety degrees, and then drawn up until the head portion bears against the under side of the

Fig. 9.

Fig. 10.

GOTTLIEB'S METALLIC RAILWAY CROSS-TIE.

beds and the square portion lies within the slots in the beds. The clamping-plates 14, having one of their ends constructed, as shown, to fit the flange of the rail, are then slipped over the bolts 13, the rails having been previously placed on the locking-plates, as shown in Figs. 1 and 2, and are then secured in place by the nuts 15. The bolts 13, may be made with only a side head, as described, or a T-head may be used. This is simply a provision whereby to insert the bolts in place from above, but where this is not deemed necessary, as in bridge ties, any suitable form of head may be used.

It will be observed in referring to Fig. 2 that by sliding the locking-plates along the supporting-plates a considerable variation in the position of the rail can be obtained. It will also be observed that any spreading action will tend to force the bolt 13, in direction of the arrow x; but as the bolt cannot move in that direction the outward pressure or force will be resolved with two forces, z and y, one tending to move the bolt along the slot in the supporting-bed, and the other to force it against the side of the slot at right angles thereto; but its tendency to move in the direction z, will cause it to bear at right angles against the slot 12, in the locking-plate and move the plate transversely across its supporting-bed, which movement will be prevented by the flange 11, being against the vertical ledge 4. These locking-plates may be formed by rolling between suitable rolls, and the blank thus rolled is then cut off into suitable lengths; and these locking-plates are then slotted, as shown, in a suitable manner; or these locking-plates may be cast in suitable molds, the slot being formed by a core in the molds. The locking-plates employed in securing the rail at one end of the cross-tie are made for straight lines of track exactly alike; but in placing them in the tie they are arranged end for end, as shown in Fig. 2.

In laying curved tracks the locking-plates are formed wedge-shaped in order that the rails resting thereon may have the requisite inclination for such curves, as shown in Figs. 5 to 8.

By reference to Figs. 5 to 8 the following differences in construction will be observed: The locking-plate shown in Fig. 5, having the slot 12, formed in its thin end, is adapted to be used in connection with the outer slot 9, in that end of the tie which will support the inner rail of the curve, and the plate shown in Fig. 6, having its slot in the thick end, is adapted to be used in connection with the inner slot 8, at the same end of the tie. The plates shown in Figs. 7 and 8, having their slots in the thin and thick ends, respectively, are to be used in connection with the slots 8 and 9, in that end of the tie which supports the outer high rail in the curve.

In order to adapt the wedge-shaped locking-plate for different points in the curves, or for the varying inclinations of the rails in different parts of the curve, a series of angular slots are formed along the plate, thereby providing by the simple longitudinal adjustment of the plates for the varying inclination of the rail—as for example, at that portion of the curve where the inclination of the rail is greatest the slots in the locking-plates which are nearest the highest portion of the plate are brought in line with slots 9, arranged along the outer line of the rails, and the slots in the locking-plates from the high portion of the plate are brought in line with the slots 8, arranged along the inner line of the rails. By this arrangement the rails are supported on the highest part of the locking-plates, and as the inclination decreases each way the locking-plates are so adjusted that the rails will rest on lower portions successively, the slots next adjacent to those employed at the point of greatest inclination being brought in line successively with the slots 8 and 9, in the cross-ties. In place of forming these wedge-like locking-plates in one piece, they may be formed as shown in Figs. 9 and 10, in which the locking-plate proper is made of uniform thickness, and on this is placed the wedge-piece 17, having a flange 18, to lock over the edge in the locking-plate to retain the wedge-piece in place. The cross-ties may be made of any desired length to adapt them for use in narrow or broad-gage or for switches or sidings.

In place of forming the cross-ties with double seats, they may be formed with a single seat, in which case the outer slots 9, would be formed in one cross-tie, and the inner slots 8, would be formed in the next cross-tie, and so on in alternating order; or the cross-tie may be formed with a rail seat or bed sufficiently broad for the reception of two locking-plates side by side; and in place of securing the locking-plates as against transverse movement by the flange above described, the same end may be effected by forming a longitudinal groove along the beds of the cross-ties for the reception of a corresponding rib or projection on the under side of the locking-plate.

In using above-described cross-tie and locking-plate it is preferable to place a washer of rubber, leather, or other suitable material between the locking-plate and cross-tie, thereby affording an elastic seat for the rails and preventing the access of water between the parts, and in place of forming the cross-ties by rolling, as above-described, they may be cast, if desired, in which case the braces 7, may or may not be formed integral with the tie.

It is not absolutely essential that the system of slots described be employed at both ends of the tie, as the slots may be made at one end, as described, and the gage being measured therefrom, a non-adjustable means of securing the rail to the other end of the tie be provided at such other end, and if the slots be made a little broader than the diameter of the bolt-shank, or if they be curved, the precise angles designated may be correspondingly varied.

Dibble's Horse-Car Canopy.

FRANK H. DIBBLE, of New Haven, Conn., has invented a canopy for street-cars employing horses as a motive power, the construction and operation of the device being shown in the accompanying illustrative cuts. The object of the invention is to provide a device which, when in use, will protect the horses from the sun and rain, and is readily removed and folded, when it occupies but a small space.

Figure 1 is a view of the canopy, illustrating the mode of attaching it to a car; and Fig. 2 is a plan view of the frame, the canopy being omitted. The reference-lettering is similar in the two cuts.

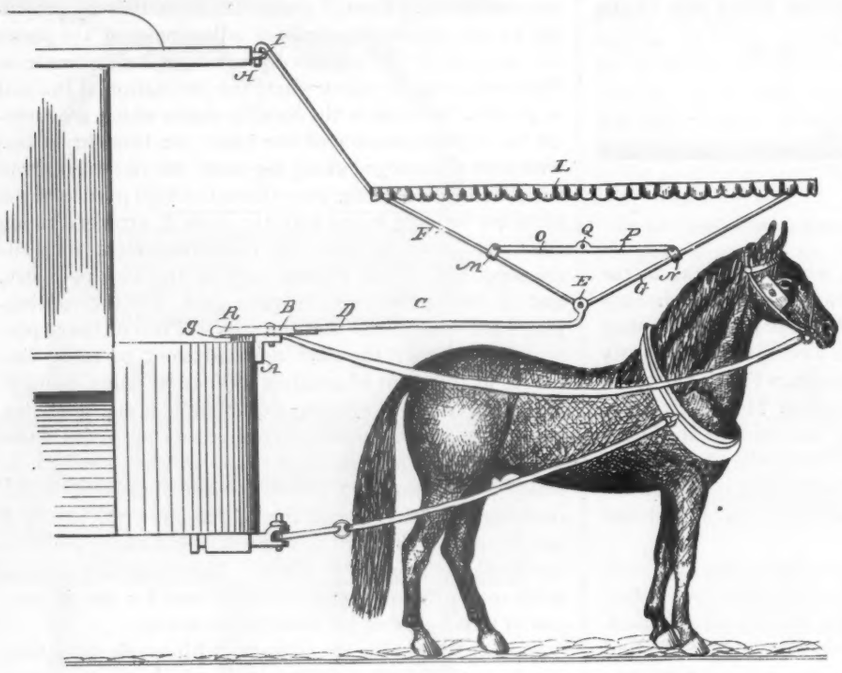


Fig. 1.

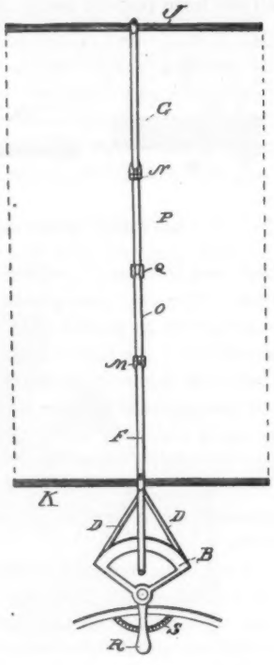


Fig. 2.

DIBBLE'S HORSE-CAR CANOPY.

Secured to the dash-board is the bracket A, to which is pivoted the swinging frame B. To this frame is attached the support-rod C, by means of stays D, and at the outer end of the support-rod are hinged at E, rods F G, the former extending upward and having its end formed into a hook H, which is pivotally held by the staple I. The rod G, extends upward and outward, and has secured to its upper end the cross-rod J, a similar cross-rod K, being secured to the rod F. From the cross-rods J K is stretched a canopy L, of sufficient width to cover the horse. Attached at M to the rod F, and at N to the rod G, are toggle-levers O P, connected at Q. By means of these toggle-jointed levers the canopy is retained in an extended position, or is readily folded when not required for use. Formed integral with the frame B, and extending rearward, is a handle R, the lower edge of which is adapted to engage with the toothed segment S, and thereby be retained in any position desired.

The operation of the device is as follows: The hook H is hooked into the staple I, and the swinging frame is pivoted to the bracket A, when the frame and canopy will be held in the required position by means of the engagement of the toothed segment and handle, as before explained, when the horse is perfectly protected from both sun and rain; and should the course of travel of the horse be changed, the canopy can readily be adjusted to suit such change by moving the handle to the desired position, where it will be retained by its engagement with the segment.

In Fig. 1 the canopy is shown adapted to a one-horse car; but it is obvious that it can, with equal facility, be adapted to a two-horse car. The weight of the canopy is about 20 lbs., and it can be changed from one end of the car to the other in one minute. It can be attached to any car without structural change, and at comparatively small expense.

Beaman's Improved Street-Railway Rail.

T. L. BEAMAN, Superintendent of the Knoxville Street-Railway, of Knoxville, Tenn., has invented an improved rail for street-railways which is herewith illustrated and described. The object of the invention is to provide a rail of improved contour which will combine the principal features of the T-rail usually employed on steam railways, and to combine therewith certain novel features which will provide a rail specially adapted for street-railways.

In the accompanying cuts, Fig. 1 is a vertical transverse section of the improved rail, and Fig. 2 is a section showing the same applied to a street-railway bed. The reference-lettering is similar in both cuts.

A represents the foot of the rail, which is provided centrally with a web B, upon which is formed the head and side flanges C and D D′. The head C is formed immediately over the web, and extends equally from each side of the center thereof. The edges of the head C are curved, as shown at E and E′, and the curve E′ at the inner side of the head is of the ogee order, and terminates in a horizontal portion F, which forms the upper face of the flange D′. The lower portion of this flange D′ is connected by a nearly straight line which is inclined downwardly to the web. The outer flange D, is curved slightly inwardly upon its under surface, as shown at F′, and extends from the center of the web outwardly the same distance as the flange D′, the terminal portion of the flange being on the same horizontal line as the upper surface of the flange D′.

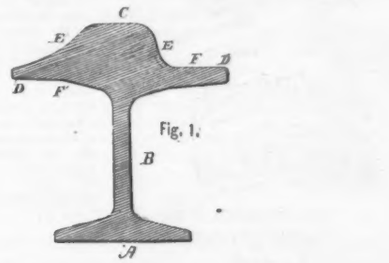


Fig. 1.

Fig. 2.

BEAMAN'S IMPROVED STREET-RAILWAY RAIL.

By the construction herein shown and described, the head of the rail is of sufficient width to receive the tread of the car-wheel, and its flange will run freely below the head. The ogee curve on the inner side of the rail forms an easy angle or curvature, so that vehicles may pass over the same. This curve also enables the flange of the car-wheel to remove readily any accumulations of ballast or earth that may collect upon the flange. The flange D′, projecting as it does, horizontally to one side, will form a track for vehicles, and will keep the flange of the car-wheel from cutting into the street. The flange D, which projects from the outer side of the head downwardly, makes the head have substantially only one side, and no sharp or abrupt corners are formed, and vehicles are enabled to cross the rail at any angle. The under side of the flange D unites with the web at a point somewhat higher than its opposite flange, thus providing for the most economical distribution of metal.

Center-bearing rails as heretofore constructed have two sharp or abrupt corners, against which the wheels of vehicles come in contact with and slide along, making ruts adjacent to the rail, and as one side only of a rail head is used by passing cars, they have thus formed an unnecessary obstruction in the streets. By providing the head with the beveled side or flange D, as shown, this objection is obviated in the present invention, and vehicles are enabled to cross the rail at any angle. By providing the head of the rail immediately above the web the pressure is distributed equally upon the foot, and no side pressure is exerted upon the spikes which hold the foot to the cross-tie.

The manner of laying the rail and the position of the head and flanges with respect to the surface of the street is fully shown in Fig. 2, and when the tracks are thus laid the wheels of vehicles in passing along either edge of the flanges will have a tendency to pack the ballast under the flanges, in the pockets formed above the foot and to each side of the web, and retain the rail in position, it being evident that as soon as these pockets are packed with ballast the rail cannot be out of place, so that even after the cross-ties have decayed the rail will be retained in position, and can only settle with the surface of the street.

This rail, as described, can be rolled weighing 40 lbs. per yard and upwards as required, and careful estimates show that the cost of laying a track with this rail will be but little above that of laying it in the usual manner with the flat rail and timber stringers and ties; and allowing for the cost of the incessant repairs required on such a track, it would seem to be more economical in the end.

A New Baggage Check.

A NEW baggage check now in use on the Lake Erie and Western road, which was invented by Mr. G. W. Smith, general passenger agent of the road, is made of manilla card-board, with four coupons. The numbers of stations appear on local checks, the route with names of principal stations on the terminal road being printed on through checks, and the destination is indicated by marks through the numbers or names of stations. The first coupon is for the passenger, the second is receipted by the train-baggageman for the agent, from which he makes his record. The third is retained by the train-baggageman and acts as a way-bill accompanying baggage to destination. The fourth, containing the name and address of the owner, is inserted in a brass shell (which is peculiarly adapted for the protection of the card check) attached to baggage by the usual strap.

The coupons show the number of train and date forwarded, time received and delivered, and are intended to take the place of reports of baggage forwarded, received and delivered, way-bills, excess baggage and storage blanks, thereby reducing expense of blanks and economizing labor.

The advantages claimed for it are that it will give an opportunity to each road to furnish its own through checks at less cost and labor for station and train-men than any where a complete record is kept and reports required; that it gives a duplicate of each check to the passenger, showing where the baggage is checked from and to, number of train and date on which forwarded, and route over which baggage is to be transported; and that it is a guide to train-men in putting off baggage, preventing the straying of baggage, as the coupons show the responsibility of any error either in handling baggage or collecting charges.

The check has been in use five months, and has given entire satisfaction in the handling of baggage, besides an increase in earnings.

NEARLY 300,000 patents have been issued by the United States Patent Office, of which 3,508 are classed under the head "railways," and 3,505 as "railway cars." Of the 7,000 patents thus indicated, probably one-half apply to car-couplers, and still inventors are at work.

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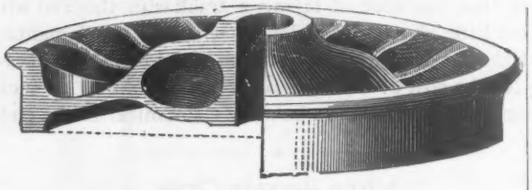

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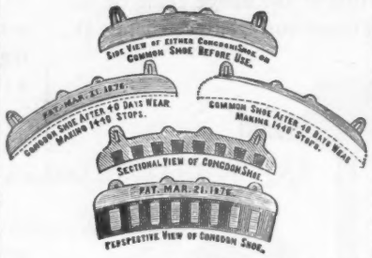
SIDE VIEW OF EITHER CONGDON SHOE OR COMMON SHOE BEFORE USE.
PAT. MAR. 21. 1876.
CONGDON SHOE AFTER 40 DAYS WEAR MAKING 1496 STOPS.
COMMON SHOE AFTER 40 DAYS WEAR MAKING 1148 STOPS.
SECTIONAL VIEW OF CONGDON SHOE.
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PERSPECTIVE VIEW OF CONGDON SHOE.

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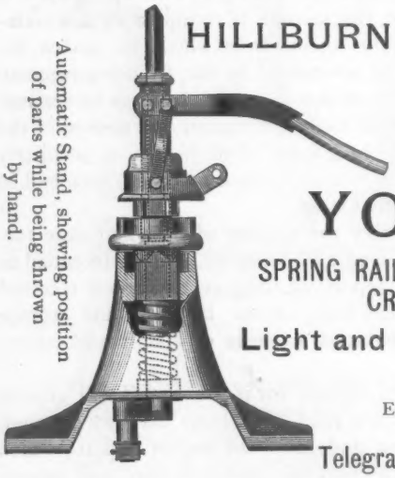

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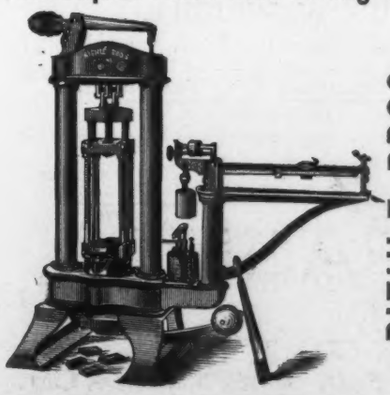

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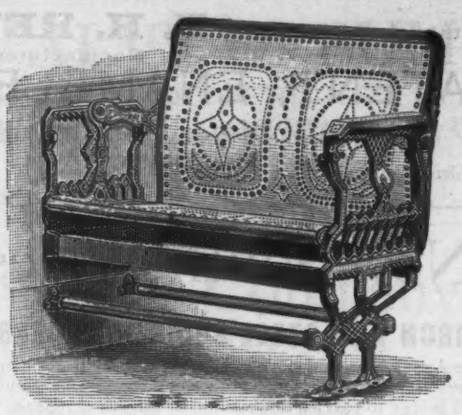

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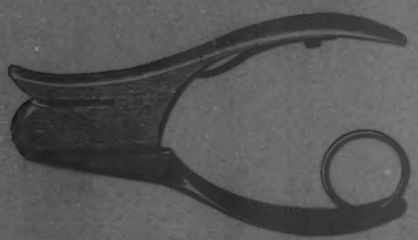

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VOL. 58 NO. 2

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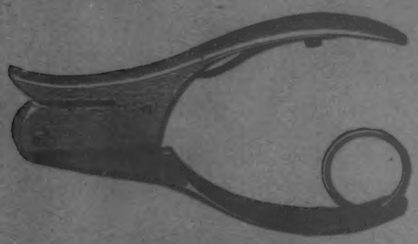

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Vol. 58 No. 3

THE AMERICAN RAILROAD JOURNAL

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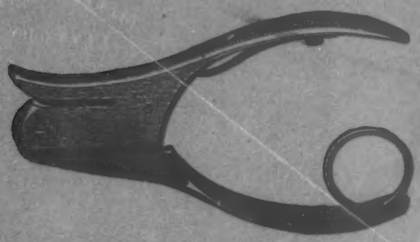

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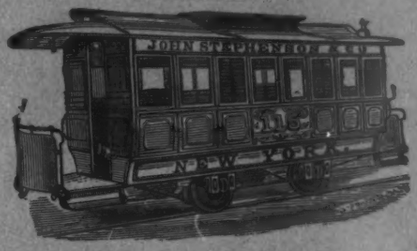

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ESTABLISHED 1831.

VOL. 58 NO. 4

THE AMERICAN RAILROAD JOURNAL

JULY, 1884.

NEW YORK
THE PHENIX PUBLISHING COMPANY
323 PEARL STREET.

Print of "The Hub," N. Y.

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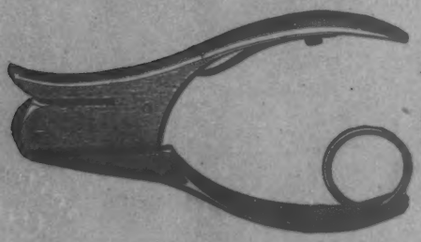

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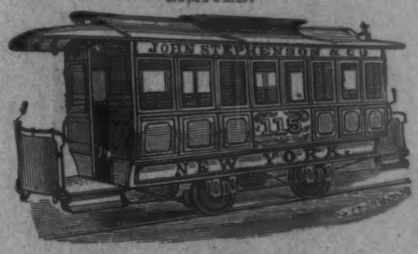

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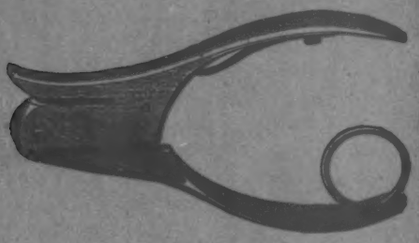

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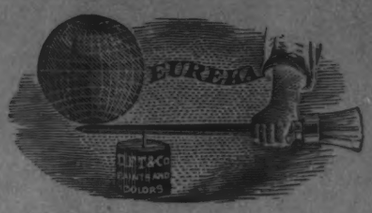

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Vol. 58 No. 6

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SEPTEMBER, 1884.

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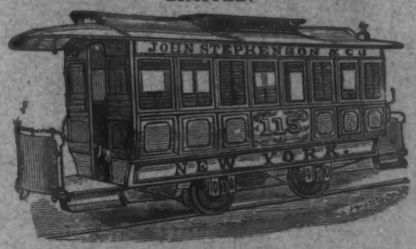

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Vol. 58 No. 7

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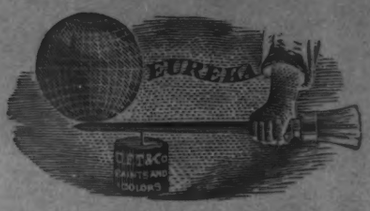

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VOL. 58 NO. 9

THE AMERICAN RAILROAD JOURNAL

DECEMBER, 1884.

American Railroad Journal,

A MONTHLY MAGAZINE AND REVIEW.

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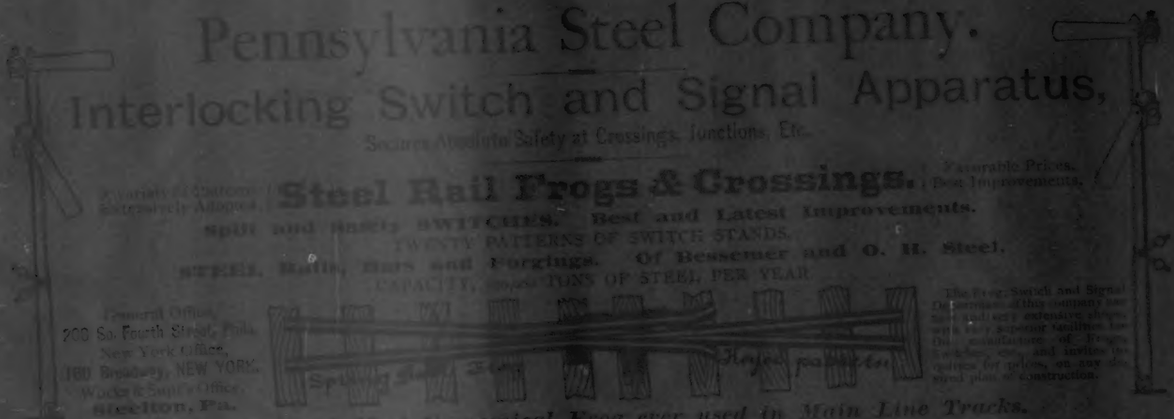

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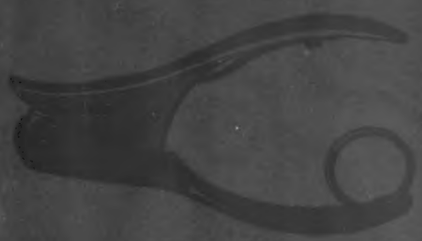

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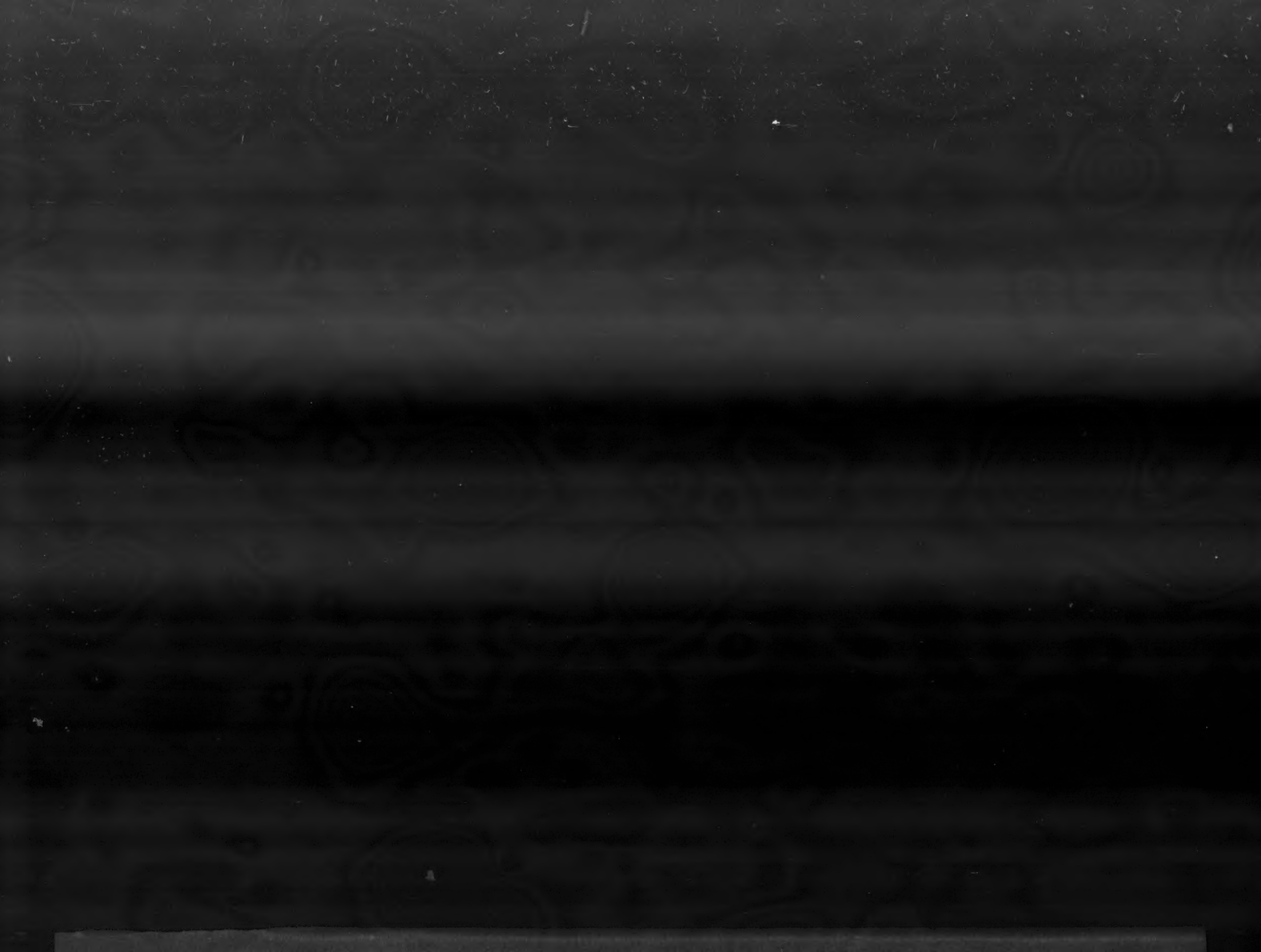
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